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Austin et al.

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[54] **SYSTEM FOR BLACK AND WHITE PRINTING OF COLORED PAGES**

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[73] Assignee: **Microsoft Corporation**, Redmond, Wash.

[21] Appl. No.: **08/658,699**

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[51] **Int. Cl.**[6] **H04N 1/40**; H04N 1/387; G06K 15/00; G09G 5/10

[52] **U.S. Cl.** **395/109**; 395/114; 358/448; 358/452; 358/453; 345/147; 345/150

[58] **Field of Search** 358/401, 448, 358/452, 453, 455, 459, 530; 395/109, 114; 345/141, 143, 144, 147, 150, 153, 154, 431, 432, 199; 348/576, 577, 649, 650, 651, 35; 707/528, 530

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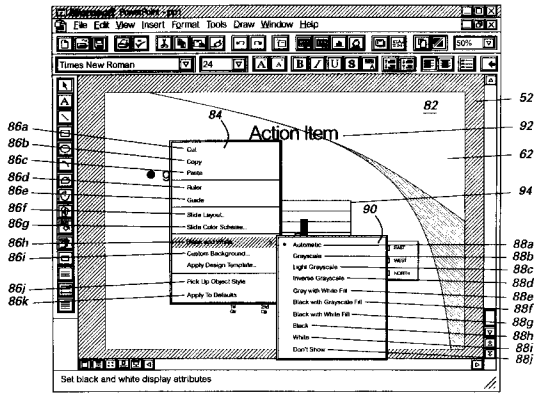
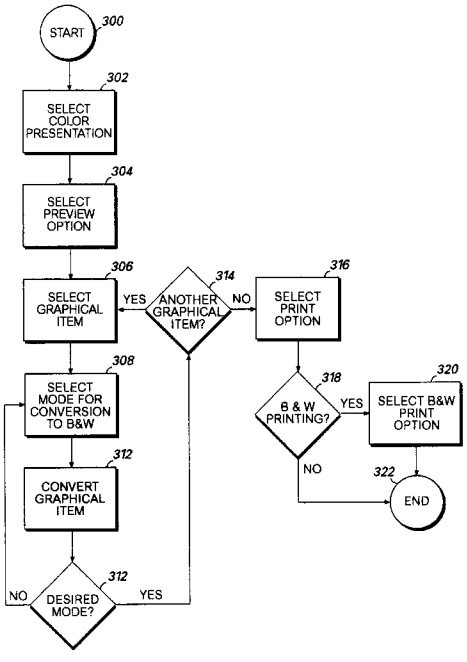
Assistant Examiner—Mark Wallerson
Attorney, Agent, or Firm—Jones & Askew, LLP

[57] **ABSTRACT**

A system for converting a colored page to a black and white page for black and white printing. A colored page is selected for conversion to black and white. The colored page contains at least one graphical item, such as text, a frame, a line, a closed shape, or a picture. One of the graphical items is then selected for conversion to black and white. After a graphical item is selected, a mode is selected for converting the selected graphical item to black and white. The modes can include a gray scale mode, a light gray scale mode, an inverse gray scale mode, a black with white fill mode, a gray with white fill mode, a black with gray fill mode, a black mode, a white mode, a don't show mode, and an automatic mode. These modes each describe a different method for converting colors in the selected graphical item to black, white, and shades of gray. The selected graphical item is then converted to black and white based on the selected mode. These tasks can be repeated for each graphical item on the colored page. The colored page is printed in black and white in response to converting each graphical item on the colored page.

54 Claims, 11 Drawing Sheets





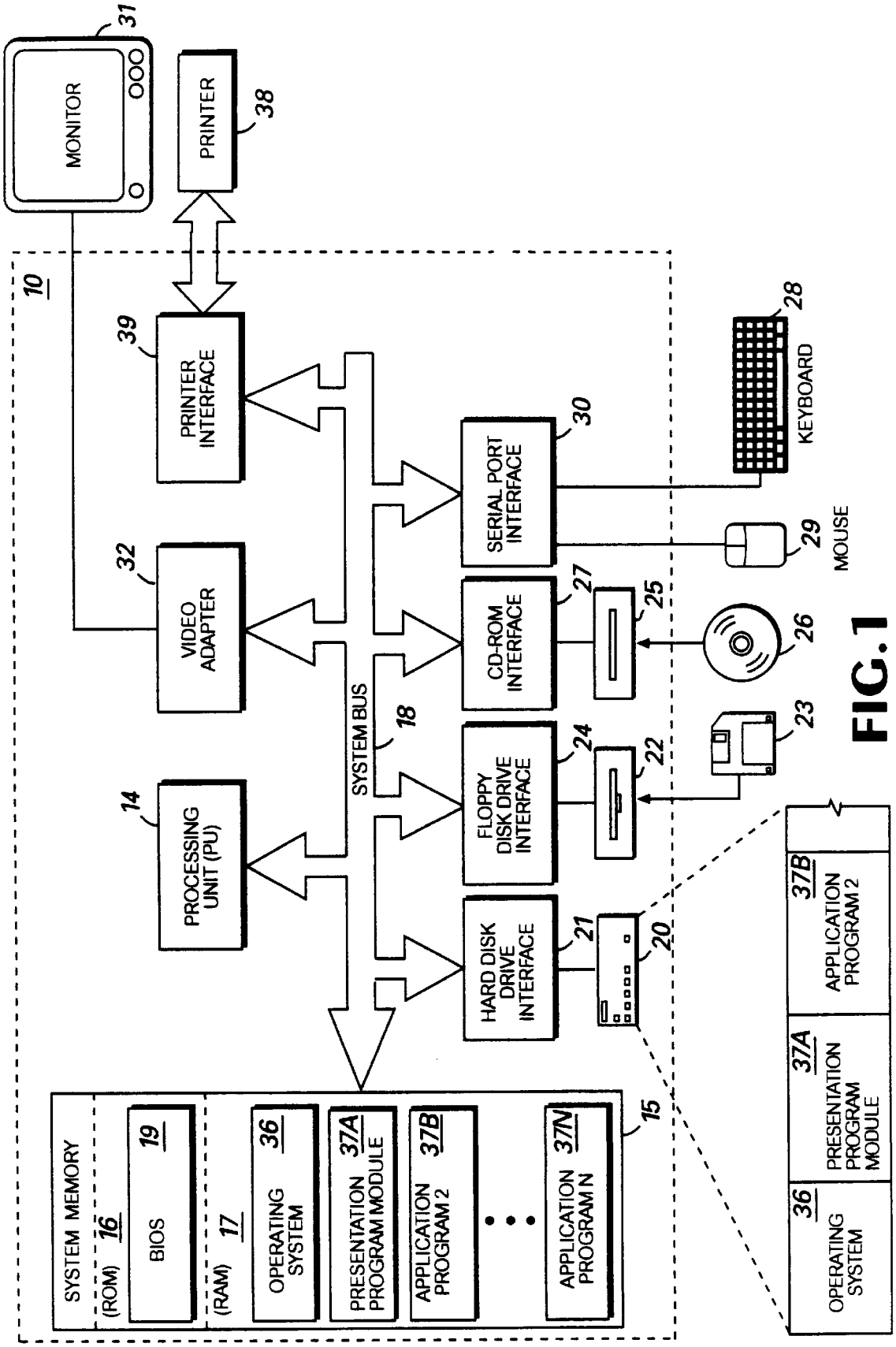

MONITOR
31
PRINTER
38
10
39
PRINTER INTERFACE
32
VIDEO ADAPTER
14
PROCESSING UNIT (PU)
SYSTEM BUS
18
SERIAL PORT INTERFACE
30
CD-ROM INTERFACE
27
FLOPPY DISK DRIVE INTERFACE
24
HARD DISK DRIVE INTERFACE
21
KEYBOARD
28
MOUSE
29
25
26
22
23
20
SYSTEM MEMORY
(ROM) 16
BIOS
19
(RAM) 17
OPERATING SYSTEM
36
PRESENTATION PROGRAM MODULE
37A
APPLICATION PROGRAM 2
37B
APPLICATION PROGRAM N
37N
15
OPERATING SYSTEM
36
PRESENTATION PROGRAM MODULE
37A
APPLICATION PROGRAM 2
37B

FIG. 1

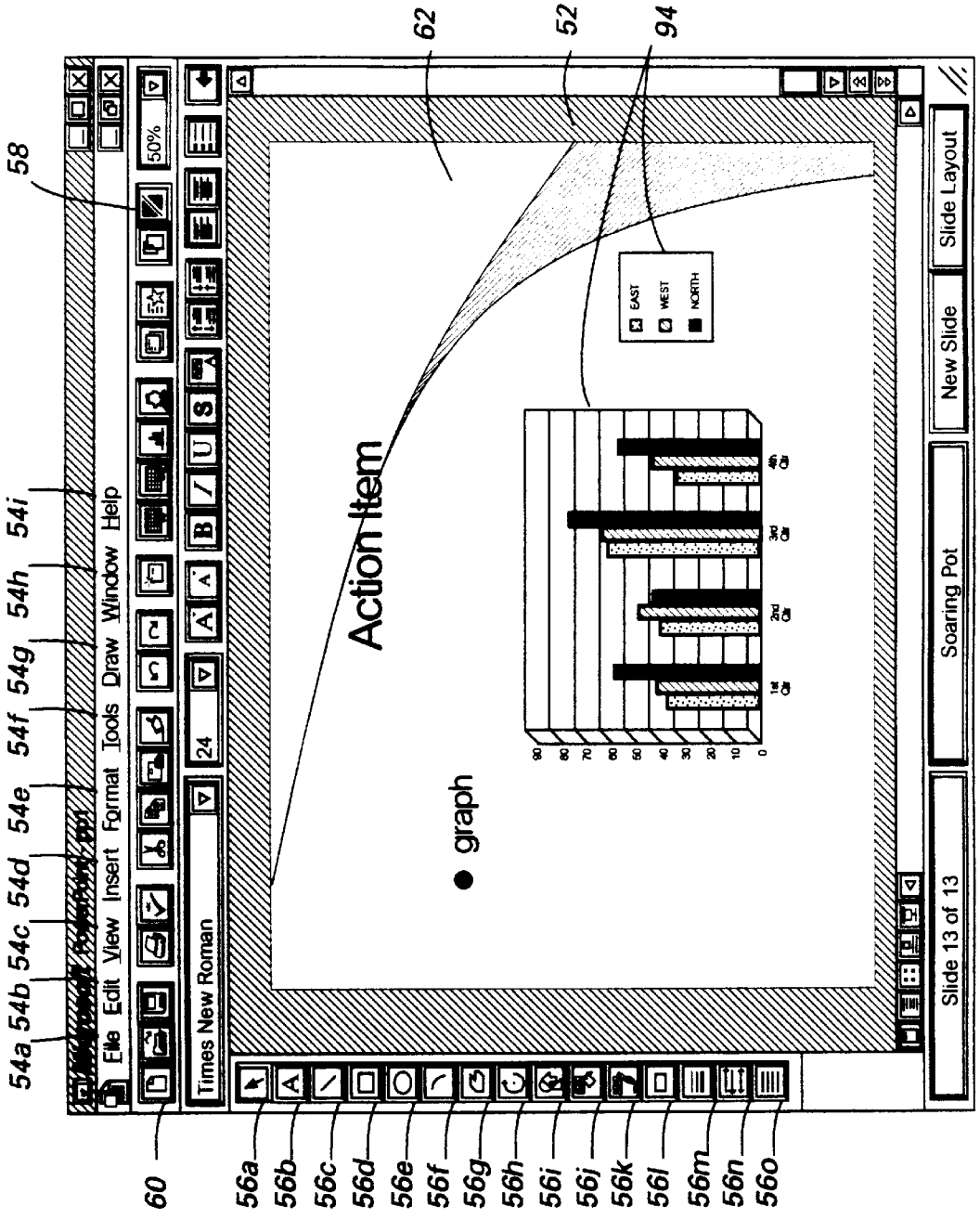

58
62
52
94
54a
54b
54c
54d
54e
54f
54g
54h
54i
60
56a
56b
56c
56d
56e
56f
56g
56h
56i
56j
56k
56l
56m
56n
56o
File Edit View Insert Format Tools Draw Window Help
Times New Roman
24
50%
Action Item
graph
EAST
WEST
NORTH
New Slide
Slide Layout
Soaring Pot
Slide 13 of 13

FIG.2a

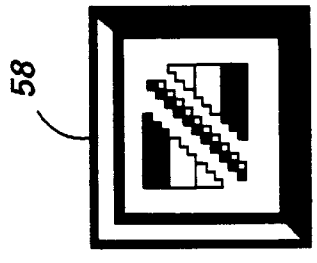

58
Enlarged View

FIG.2b

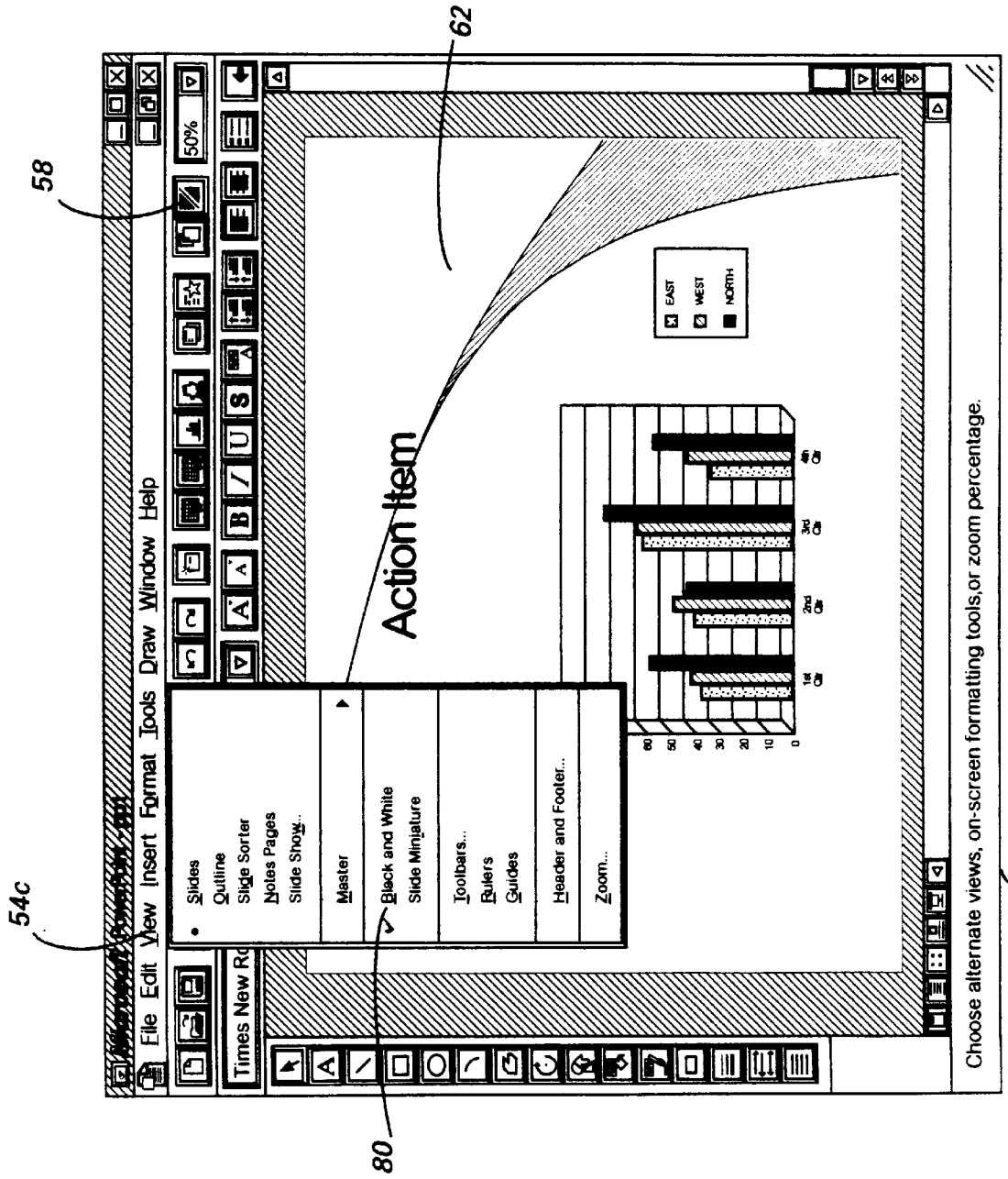

58
62
54c
80
50
File Edit View Insert Format Tools Draw Window Help
Times New Ro
50%
Slides
Outline
Slide Sorter
Notes Pages
Slide Show...
Master
Black and White
Slide Miniature
Toolbars...
Rulers
Guides
Header and Footer...
Zoom...
Action Item
EAST
WEST
NORTH
1st Qtr
2nd Qtr
3rd Qtr
4th Qtr
60
50
40
30
20
10
0
Choose alternate views, on-screen formatting tools,or zoom percentage.

FIG. 3

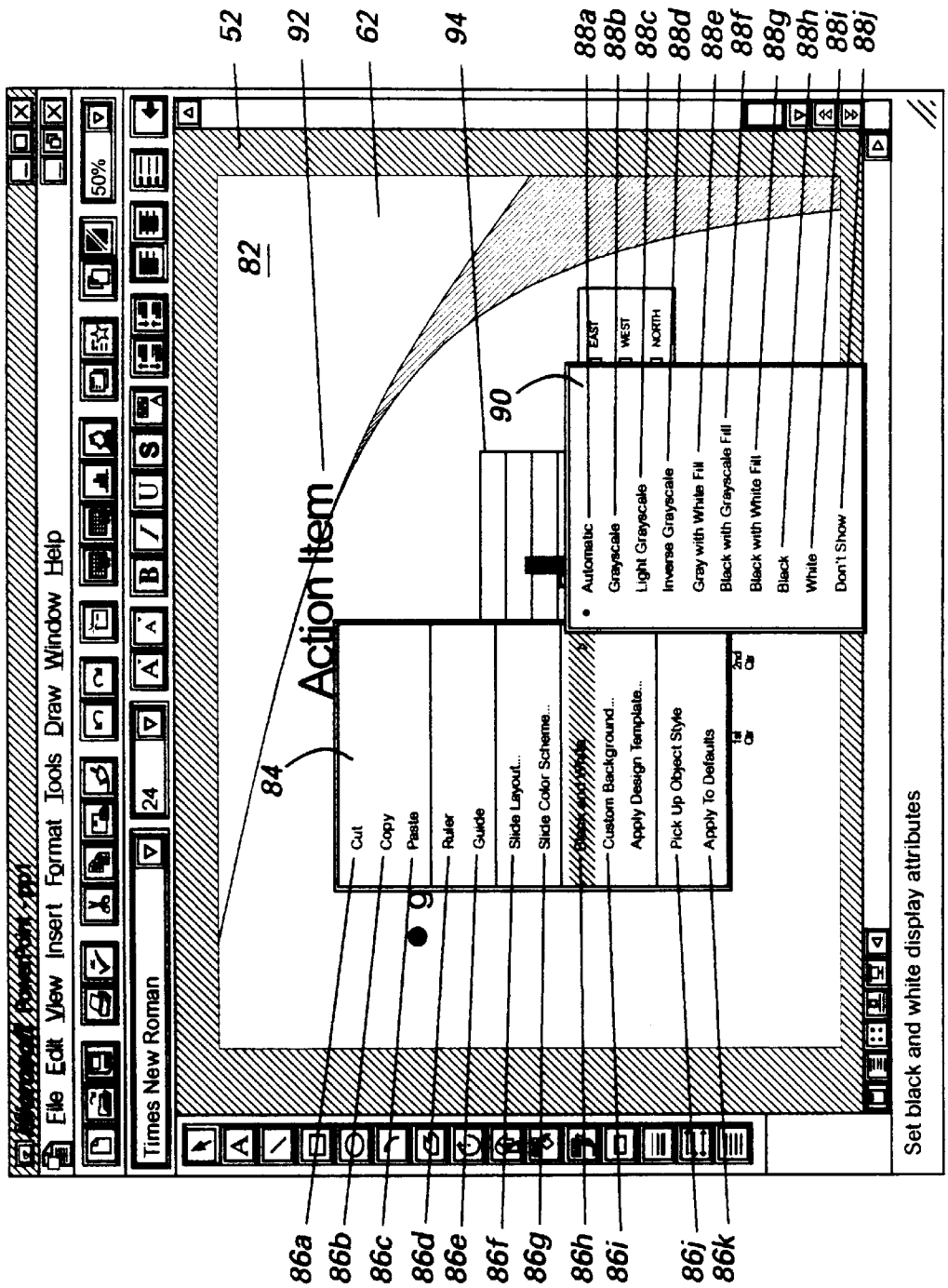

52
92
62
94
88a
88b
88c
88d
88e
88f
88g
88h
88i
88j
82
84
90
Action Item
File Edit View Insert Format Tools Draw Window Help
Times New Roman
24
50%
Cut
Copy
Paste
Ruler
Guide
Slide Layout...
Slide Color Scheme...
Custom Background...
Apply Design Template...
Pick Up Object Style
Apply To Defaults
EAST
WEST
NORTH
Automatic
Grayscale
Light Grayscale
Inverse Grayscale
Gray with White Fill
Black with Grayscale Fill
Black with White Fill
Black
White
Don't Show
Set black and white display attributes
86a
86b
86c
86d
86e
86f
86g
86h
86i
86j
86k

FIG.4

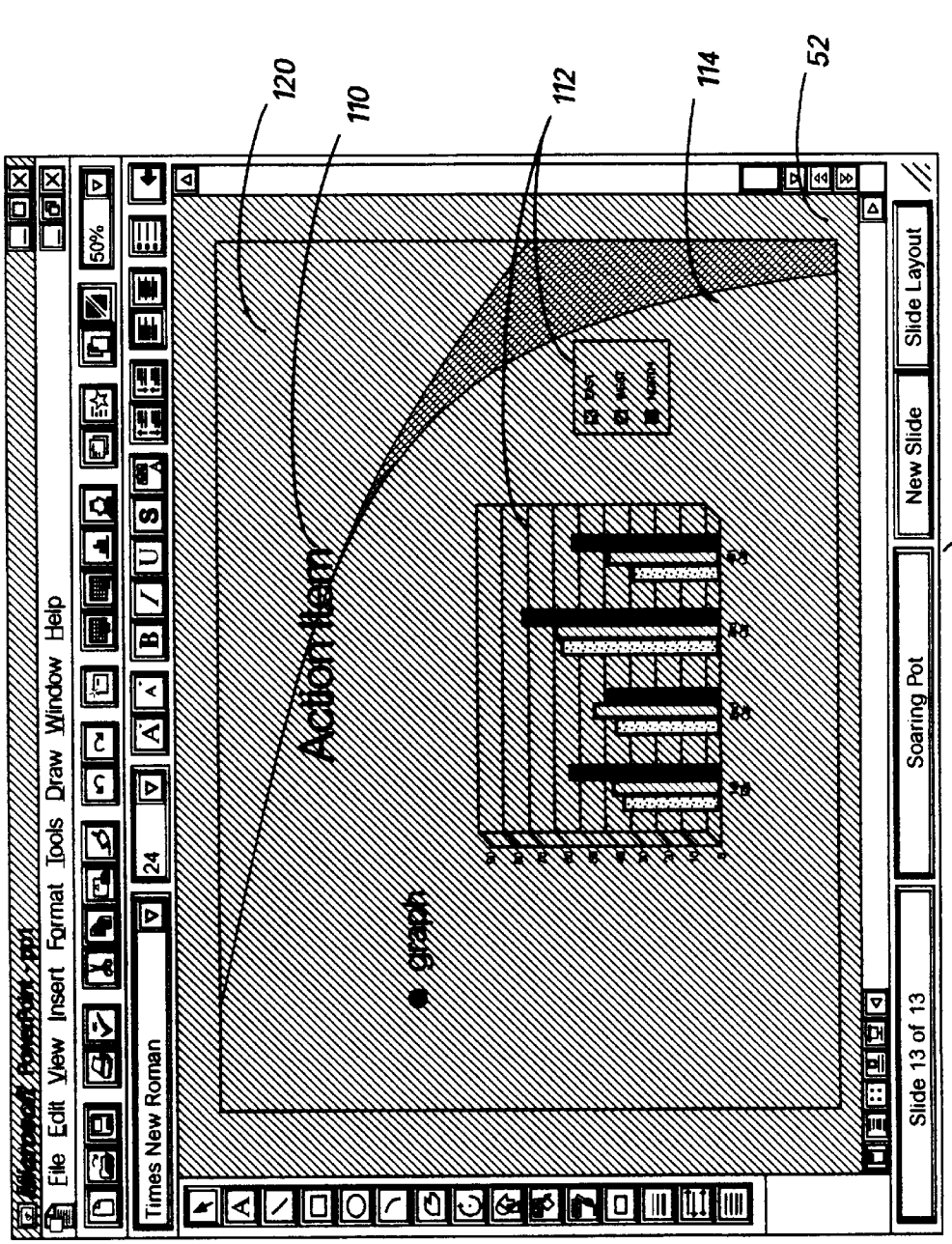

120
110
112
114
52
50
File Edit View Insert Format Tools Draw Window Help
Times New Roman
24
50%
Action Item
Graph
New Slide
Slide Layout
Soaring Pot
Slide 13 of 13

FIG. 5

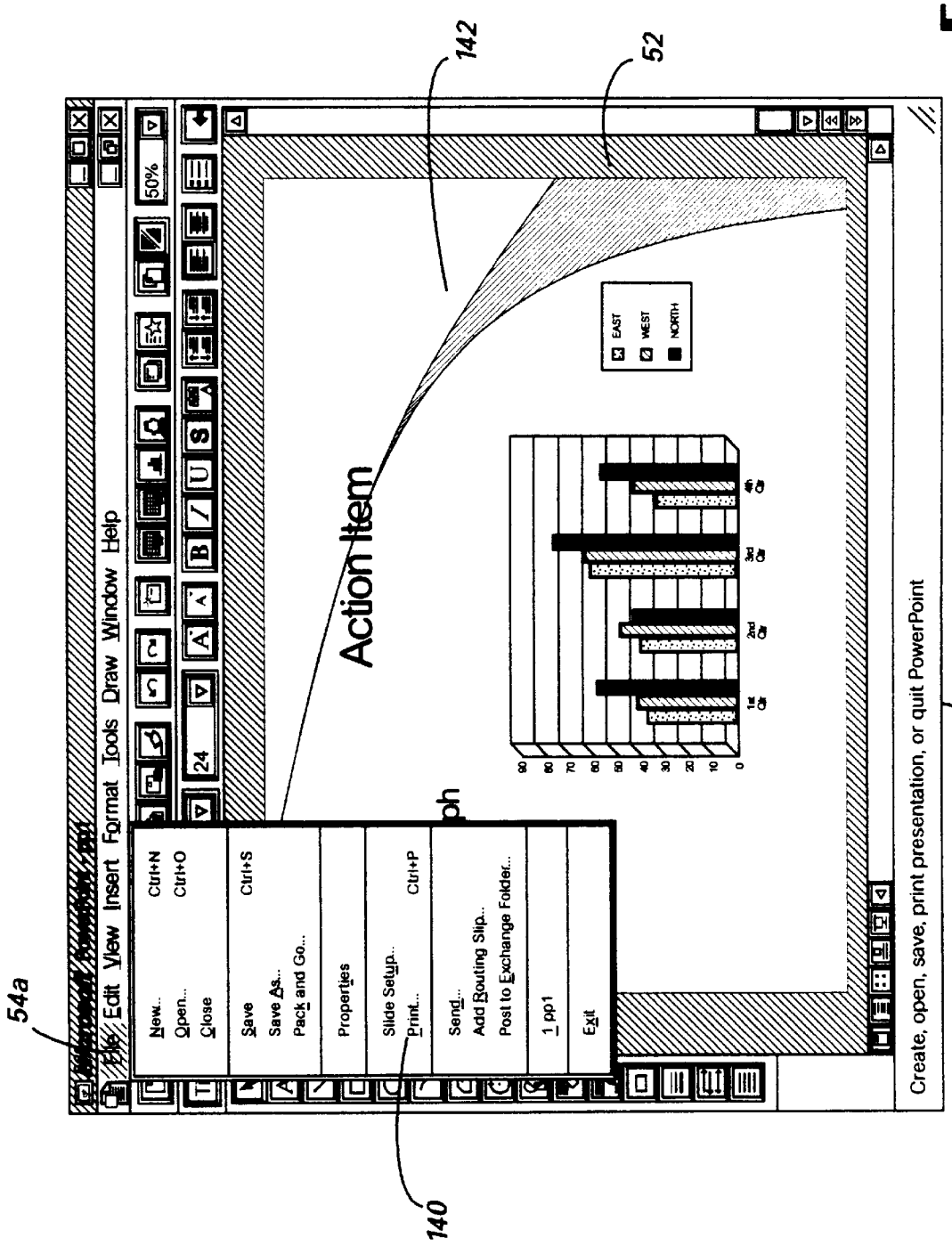

142
52
54a
140
50
File Edit View Insert Format Tools Draw Window Help
New... Ctrl+N
Open... Ctrl+O
Close
Save Ctrl+S
Save As...
Pack and Go...
Properties
Slide Setup...
Print... Ctrl+P
Send...
Add Routing Slip...
Post to Exchange Folder...
1 pp1
Exit
Action Item
EAST
WEST
NORTH
Create, open, save, print presentation, or quit PowerPoint

FIG. 6

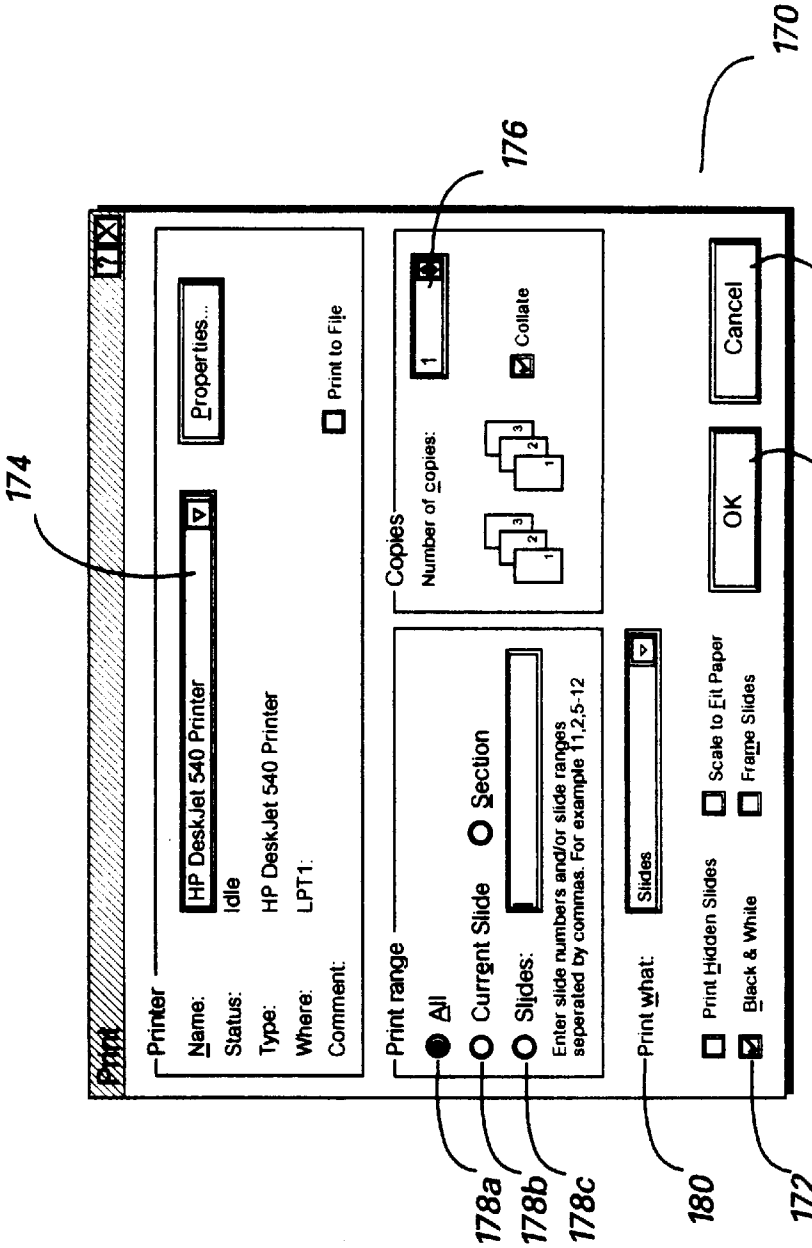

Print
Printer
Name:
HP DeskJet 540 Printer
Properties...
Status:
Idle
Type:
HP DeskJet 540 Printer
Where:
LPT1:
Comment:
Print to File
Print range
All
Current Slide
Section
Slides:
Enter slide numbers and/or slide ranges seperated by commas. For example 11,2,5-12
Print what:
Slides
Print Hidden Slides
Scale to Fit Paper
Black & White
Frame Slides
Copies
Number of copies:
1
Collate
OK
Cancel
174
176
170
184
182
178a
178b
178c
180
172

FIG.7

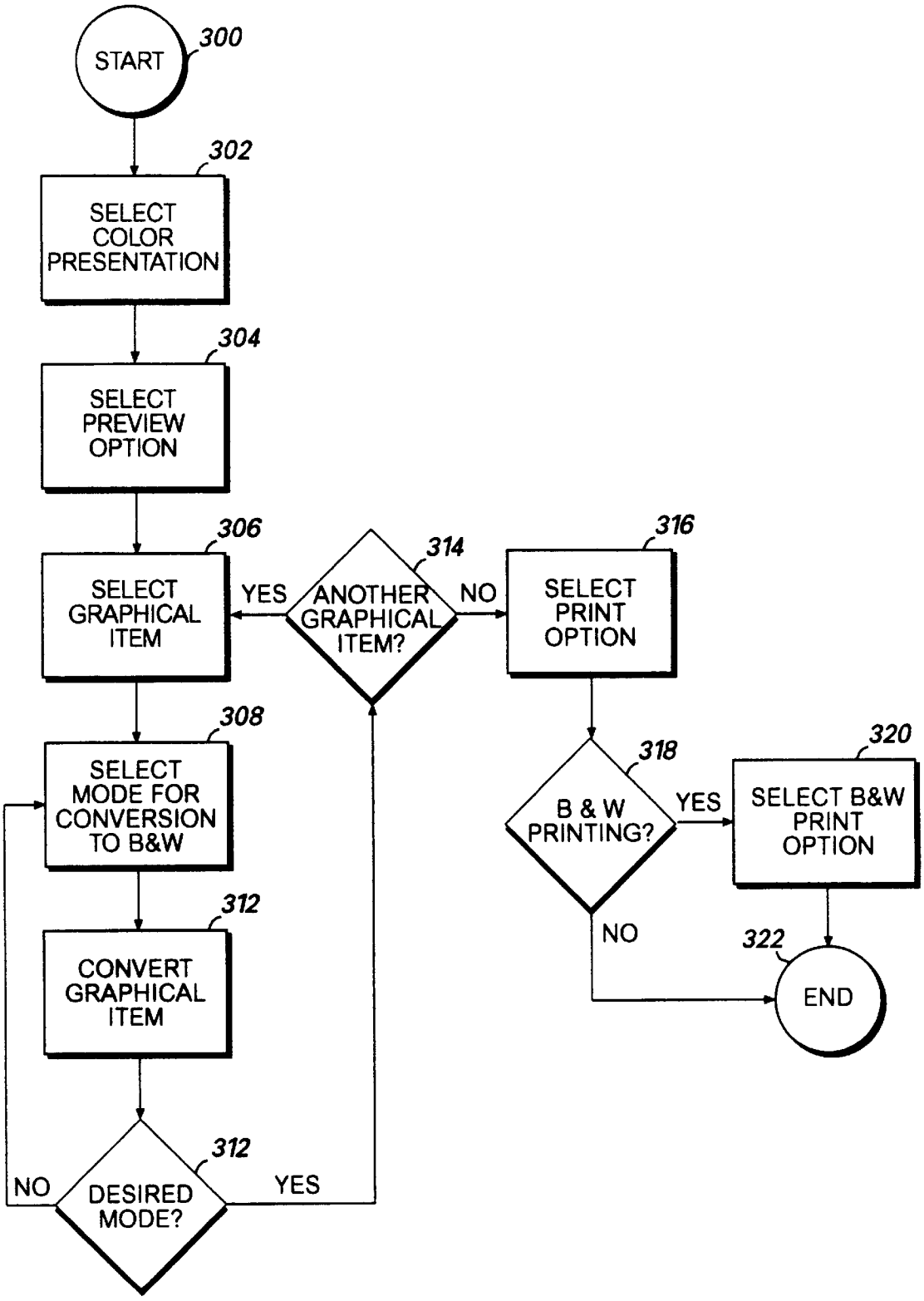

START
300
302
SELECT COLOR PRESENTATION
304
SELECT PREVIEW OPTION
306
SELECT GRAPHICAL ITEM
308
SELECT MODE FOR CONVERSION TO B&W
312
CONVERT GRAPHICAL ITEM
312
DESIRED MODE?
NO
YES
314
ANOTHER GRAPHICAL ITEM?
YES
NO
316
SELECT PRINT OPTION
318
B & W PRINTING?
YES
NO
320
SELECT B&W PRINT OPTION
322
END

FIG.8

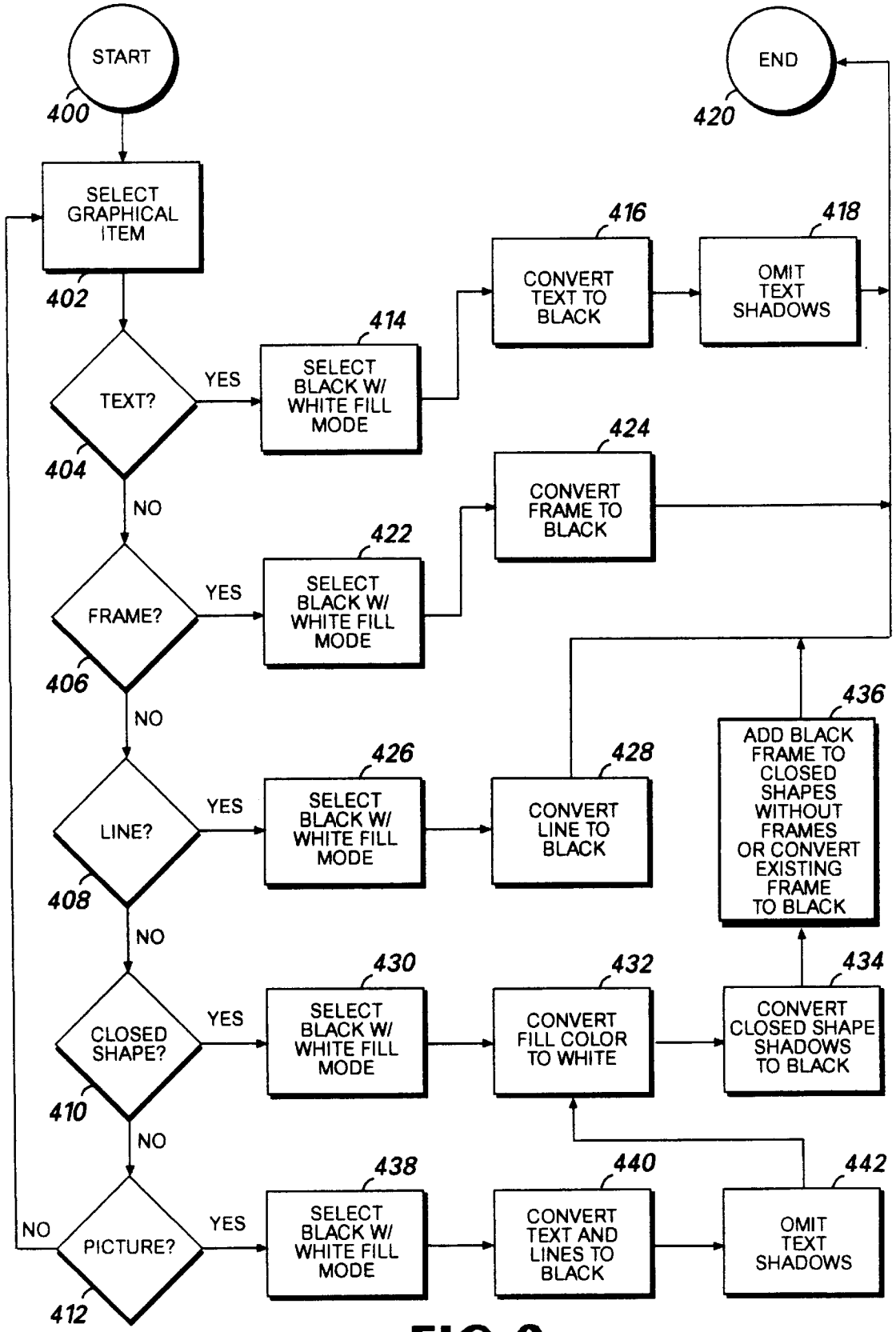

START
400
SELECT GRAPHICAL ITEM
402
TEXT?
404
YES
SELECT BLACK W/ WHITE FILL MODE
414
CONVERT TEXT TO BLACK
416
OMIT TEXT SHADOWS
418
END
420
NO
FRAME?
406
YES
SELECT BLACK W/ WHITE FILL MODE
422
CONVERT FRAME TO BLACK
424
NO
LINE?
408
YES
SELECT BLACK W/ WHITE FILL MODE
426
CONVERT LINE TO BLACK
428
ADD BLACK FRAME TO CLOSED SHAPES WITHOUT FRAMES OR CONVERT EXISTING FRAME TO BLACK
436
NO
CLOSED SHAPE?
410
YES
SELECT BLACK W/ WHITE FILL MODE
430
CONVERT FILL COLOR TO WHITE
432
CONVERT CLOSED SHAPE SHADOWS TO BLACK
434
NO
PICTURE?
412
YES
SELECT BLACK W/ WHITE FILL MODE
438
CONVERT TEXT AND LINES TO BLACK
440
OMIT TEXT SHADOWS
442
NO

FIG.9

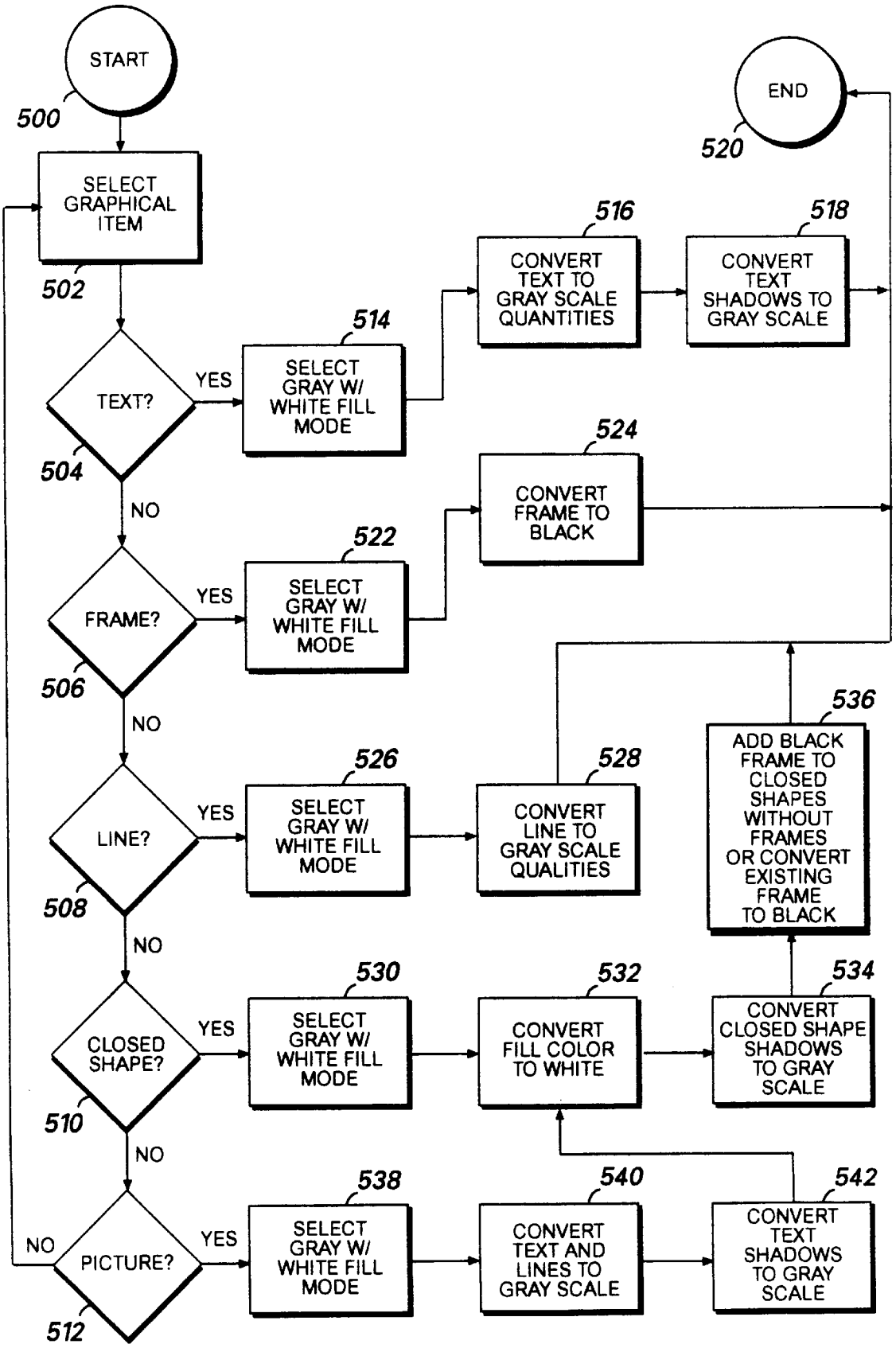

START
500
SELECT GRAPHICAL ITEM
502
TEXT?
504
YES
SELECT GRAY W/ WHITE FILL MODE
514
CONVERT TEXT TO GRAY SCALE QUANTITIES
516
CONVERT TEXT SHADOWS TO GRAY SCALE
518
END
520
NO
FRAME?
506
YES
SELECT GRAY W/ WHITE FILL MODE
522
CONVERT FRAME TO BLACK
524
NO
LINE?
508
YES
SELECT GRAY W/ WHITE FILL MODE
526
CONVERT LINE TO GRAY SCALE QUALITIES
528
ADD BLACK FRAME TO CLOSED SHAPES WITHOUT FRAMES OR CONVERT EXISTING FRAME TO BLACK
536
NO
CLOSED SHAPE?
510
YES
SELECT GRAY W/ WHITE FILL MODE
530
CONVERT FILL COLOR TO WHITE
532
CONVERT CLOSED SHAPE SHADOWS TO GRAY SCALE
534
NO
PICTURE?
512
YES
SELECT GRAY W/ WHITE FILL MODE
538
CONVERT TEXT AND LINES TO GRAY SCALE
540
CONVERT TEXT SHADOWS TO GRAY SCALE
542

FIG.10

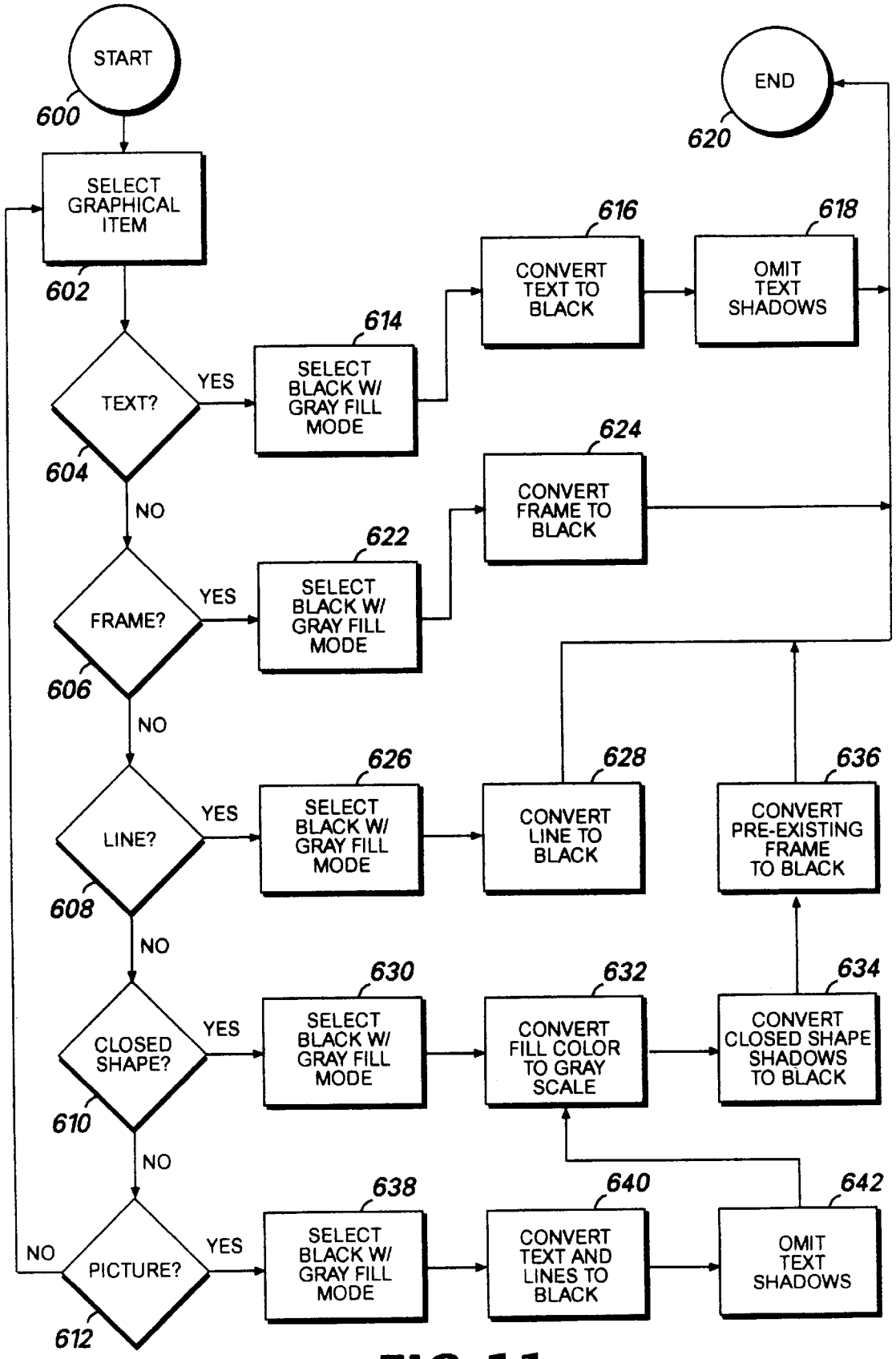

START
600
SELECT GRAPHICAL ITEM
602
TEXT?
604
YES
SELECT BLACK W/ GRAY FILL MODE
614
CONVERT TEXT TO BLACK
616
OMIT TEXT SHADOWS
618
NO
FRAME?
606
YES
SELECT BLACK W/ GRAY FILL MODE
622
CONVERT FRAME TO BLACK
624
NO
LINE?
608
YES
SELECT BLACK W/ GRAY FILL MODE
626
CONVERT LINE TO BLACK
628
CONVERT PRE-EXISTING FRAME TO BLACK
636
NO
CLOSED SHAPE?
610
YES
SELECT BLACK W/ GRAY FILL MODE
630
CONVERT FILL COLOR TO GRAY SCALE
632
CONVERT CLOSED SHAPE SHADOWS TO BLACK
634
NO
PICTURE?
612
YES
NO
SELECT BLACK W/ GRAY FILL MODE
638
CONVERT TEXT AND LINES TO BLACK
640
OMIT TEXT SHADOWS
642
END
620

FIG.11

SYSTEM FOR BLACK AND WHITE PRINTING OF COLORED PAGES

FIELD OF THE INVENTION

The present invention relates to a printing system for a computer system, and is more particularly directed to a system for black and white printing of a colored page by converting each color graphical item on the page to a selected black and white mode.

BACKGROUND OF THE INVENTION

Making presentations and conducting meetings are important aspects of many occupations. Executives make presentations to directors, managers conduct meetings with staff, salespersons make presentations to potential customers, doctors conduct meetings with nurses, lawyers make presentations to juries, and so on. A great many professionals conduct and attend meetings and presentations regularly. Much effort therefore goes into creating and delivering effective presentations and preparing for and conducting effective meetings.

With specialized software, conventional personal computers provide effective platforms for creating and conducting presentations and meetings. Currently available presentation program modules can turn a personal computer into a customized presentation system for creating, delivering, and printing slide presentations. Generally described, these presentation systems provide a specially designed, user-friendly, palette of tools to assist in the creation of presentation slides to be subsequently displayed to an audience. These presentation systems also allow the slides to be sequentially presented to an audience, point-by-point and slide-by-slide, with color, animation, audio, and transition effects that enrich and enliven the presentation.

After designing the color presentations, the user may also want to print the color presentations so that the audience may have personal copies for note-taking during delivery of the presentation and for future reference. Because providing color versions of the presentation is usually expensive, oftentimes, the user provides black and white versions of the color presentations. The conversion process and printing process are supported by the presentation program modules.

In some presentation program modules, a standard process is typically used for converting the color presentations to black and white. This process converts any color picture to a gray scale rendition, which is a conversion of color images to varying shades of gray. For color presentations, however, a simple gray scale conversion is generally inadequate because presentation images frequently have a dark, and sometimes complex, decorative background. Fades, filled objects, and backgrounds, which look great on an on-screen color presentation, are often unreadable in the form of a printed handout. As a result, other computer printing systems supported by presentation program modules have been designed to provide improved conversion methods for color presentations.

One method implemented to provide an improved translation from a color presentation to a black and white presentation is preparing special black and white templates, which are used as substitutes for the colors from a color template. One problem with this black and white conversion is that it creates a new black and white presentation that can greatly vary from the color presentation. Another problem is that when the user makes custom changes to the black and white presentation, there is no way to preserve the color and black and white versions in synchronization. Also, there is

no automatic method for deriving a customized black and white version so that it can be re-derived whenever necessary as edits are made in the color version.

Another method used provides a black and white checkbox in the print dialog box of a screen display for supporting print operations. In response to selection of the checkbox, the program supports an automatic conversion of a color presentation to black and white. This conversion employs a gray scale conversion for the color presentation. The text is printed in black and white, and the program determines the best black and white conversion based on the type of art to be converted. The problem with this method is that the user has no control over the black and white conversion operations. Also, the user cannot see the conversion to black and white before printing the presentation on a printer.

One additional method for converting color presentations to black and white omits any complex backgrounds and replaces the complex backgrounds with a white background. Color images are converted to black and white images. One drawback with implementing this method is that when text is printed in any color other than black and fills are colored, the text and fills do not print well in black and white.

A user needs flexibility in converting complex color presentations, as well as the ability to see the conversions as they are implemented on-screen. It is usually preferable to change a complex background to white and reduce it's complexity. Foreground figures and text typically print better in solid black. Other figures, like pictures and company logo types, are better rendered with a standard conversion to gray scale.

Therefore, there is a need for a system that allows more control over converting a color presentation to black and white. There is also a need for a system that allows images, objects and text on a page to be converted item-by-item. Furthermore, there is a need for a system that allows the black and white version of the color presentation to be viewed as each item is converted to black and white before printing the presentation. Finally, there is a need for a system that provides a variety of modes for black and white conversion of a color presentation.

SUMMARY OF THE INVENTION

The present invention satisfies the above-described needs by providing an improved system for converting a colored page to a black and white page for black and white printing The first step is to select the colored page for conversion to black and white. The colored page contains at least one graphical item, such as text, a frame, a line, a closed shape, or a picture. The next step is to select one of the graphical items for conversion to black and white. After a graphical item is selected, a print mode is selected for converting the selected graphical item to black and white. The print modes include a gray scale mode, a light gray scale mode, an inverse gray scale mode, a black with white fill mode, a gray with white fill mode, a black with gray fill mode, a black mode, a white mode, a don't show mode, and an automatic mode. These modes each describe a different method for converting colors in the selected graphical item to black, white, and shades of gray. The next step is to convert the selected graphical item to black and white based on the selected mode. The tasks are repeated for each graphical item on the colored page. The colored page is printed in black and white in response to converting each graphical item on the colored page.

In view of the foregoing, the present invention provides an improved system for black and white printing of a colored

page. The system allows more control over converting a color presentation to black and white by converting images, objects and text on a page to black and white on an item-by-item basis. The system allows the black and white version of the color presentation to be viewed on a display device as each item is converted to black and white before printing the presentation.

These and other objects, features, and advantages of the present invention may be more clearly understood and appreciated from a review of the following detailed description of the disclosed embodiments and by reference to the appended drawings and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a personal computer that provides the operating environment for the preferred embodiment of the present invention.

FIG. **2***a* is a screen display illustrating an initial presentation display screen in accordance with the preferred embodiment of the present invention.

FIG. **2***b* is a drawing of an enlarged view of a preview button in accordance with the preferred embodiment of the present invention.

FIG. **3** is a screen display illustrating of use of a "View" menu in accordance with the preferred embodiment of the present invention.

FIG. **4** is a screen display illustrating a selection of a graphical item and a contextual menu associated with the graphical item in accordance with the preferred embodiment of the present invention.

FIG. **5** is a screen display illustrating a customized version of the presentation of FIG. **4** in accordance with the preferred embodiment of the present invention.

FIG. **6** is a screen display illustrating a selection of a "File" menu in connection with printing a black and white presentation on a printer in accordance with the preferred embodiment of the present invention.

FIG. **7** is a screen display illustrating a print dialog box in accordance with the preferred embodiment of the present invention.

FIG. **8** is a flow diagram illustrating steps that a user follows to create a black and white version of a color presentation in accordance with the preferred embodiment of the present invention.

FIG. **9** is a flow diagram illustrating steps for converting a graphical item to black and white in response to selection of a Black With White Fill mode in accordance with the preferred embodiment of the present invention.

FIG. **10** is a flow diagram illustrating the steps for converting a graphical item to black and white in response to selection of a Gray With White Fill mode in accordance with the preferred embodiment of the present invention.

FIG. **11** a flow diagram illustrating the steps for converting a graphical item to black and white in response to selection of a Black With Gray Fill mode in accordance with the preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The present invention is directed to a system for black and white printing of colored pages, which are primarily designed for viewing on a computer display or a color slide. The preferred environment of the present invention is represented by "MICROSOFT POWERPOINT FOR WINDOWS 95" application program, which is marketed by Microsoft Corporation of Redmond, Wash. Briefly described, the preferred program allows a user to design on-screen color presentations and convert these presentations to black and white by selecting from a variety of modes for black and white conversion. The present invention provides a computer-implemented process for converting color images, objects and text on a page, item-by-item, to black and white and is used within the framework of the "MICROSOFT POWERPOINT FOR WINDOWS 95" application program to support printing of presentations. Moreover, the user can design or select a colored page, supported by a program module, and alter the colored images, objects, and text on the page, item-by-item, to obtain an on-screen black and white view of each graphical item before printing the page. Thus, the preferred program provides a system for black and white printing of a colored page after conversion of selected graphical items on the page to one of a plurality of black and white modes selected by a user.

Although the preferred embodiment will be generally described in the context of a program and an operating system running on a personal computer, those skilled in the art will recognize that the present invention also can be implemented in conjunction with other program modules for other types of computers. Furthermore, those skilled in the art will recognize that the present invention may be implemented in a stand-alone or in a distributed computing environment. In a distributed computing environment, program modules may be physically located in different local and remote memory storage devices. Execution of the program modules may occur locally in a stand-alone manner or remotely in a client/server manner. Examples of such distributed computing environments include local area networks of an office, enterprise-wide computer networks, and the global Internet.

The detailed description which follows is represented largely in terms of processes and symbolic representations of operations by conventional computer components, including a processing unit (PU), memory storage devices, display devices, and input devices. Furthermore, these processes and operations may utilize conventional computer components in a heterogeneous distributed computing environment, including remote file servers, compute servers, and memory storage devices. Each of these distributed computing components is accessible by the PU via a communication network.

The processes and operations performed by the computer include the manipulation of signals by a PU or remote server and the maintenance of these signals within data structures resident in one or more of the local or remote memory storage devices. Such data structures impose a physical organization upon the collection of data stored within a memory storage device and represent specific electrical or magnetic elements. These symbolic representations are the means used by those skilled in the art of computer programming and computer construction to most effectively convey teachings and discoveries to others skilled in the art.

For the purposes of this discussion, a process is generally conceived to be a sequence of computer-executed steps leading to a desired result. These steps generally require physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical, magnetic, or optical signals capable of being stored, transferred, combined, compared, or otherwise manipulated. It is conventional for those skilled in the art to refer to these signals as bits, bytes, words, values, elements,

symbols, characters, terms, numbers, points, records, objects, images, files or the like. It should be kept in mind, however, that these and similar terms should be associated with appropriate physical quantities for computer operations, and that these terms are merely conventional labels applied to physical quantities that exist within and during operation of the computer.

It should also be understood that manipulations within the computer are often referred to in terms such as selecting, converting, adding, comparing, calculating, moving, positioning, placing, altering, printing, etc. which are often associated with manual operations performed by a human operator. The operations described herein are machine operations performed in conjunction with various input provided by a human operator or user that interacts with the computer.

In addition, it should be understood that the programs, processes, methods, etc. described herein are not related or limited to any particular computer or apparatus, nor are they related or limited to any particular communication network architecture. Rather, various types of general purpose machines may be used with program modules constructed in accordance with the teachings described herein. Similarly, it may prove advantageous to construct a specialized apparatus to perform the method steps described herein by way of dedicated computer systems in a specific network architecture with hard-wired logic or programs stored in nonvolatile memory, such as read only memory.

Referring now to the drawings, in which like numerals represent like elements throughout the several figures, aspects of the present invention and the preferred operating environment will be described.

FIG. **1** illustrates various aspects of the preferred computing environment in which the present invention is designed to operate. Those skilled in the art will immediately appreciate that FIG. **1** and the associated discussion are intended to provide a brief, general description of the preferred computer hardware and program modules, and that additional information is readily available in the appropriate programming manuals, user's guides, and similar publications.

As shown in FIG. **1**, a personal computer **10** includes a processing unit (PU) **14**, such as the 80486 or "PENTIUM" microprocessors manufactured by Intel Corporation of Santa Clara, Calif. It will be understood that the computer **10** can include other PU models, such as a member of the MIPS family by Silicon Graphics, Inc. or a Power PC processor by Motorola Corporation. The personal computer also includes system memory **15** (including read only memory (ROM) **16** and random access memory (RAM) **17**), which is connected to the PU **14** by a system bus **18**. The BIOS **19** for the personal computer **10** is stored in ROM **16**. Those skilled in the art will recognize that the BIOS **19** is a set of basic routines that helps to transfer information between elements within the preferred personal computer **10**. Although the preferred computer **10** includes a ROM-based BIOS, those skilled in the art will appreciate that the computer **10** can be implemented by other computer models, such as the Apple "Macintosh" series or a SUN workstation.

Within the personal computer **10**, a local hard disk drive **20** is connected to the system bus **18** via a hard disk drive interface **21**. A floppy disk drive **22**, which is used to read or write a floppy disk **23**, is connected to the system bus **18** via a floppy disk drive interface **24**. A CD-ROM drive **25**, which is used to read a CD-ROM disk **26**, is connected to the system bus **18** via a CD-ROM interface **27**. A user enters commands and information into the personal computer **10** by using a keyboard **28** and/or pointing device, such as a mouse **29**, which are connected to the system bus **18** via a serial port interface **30**. Other types of pointing devices (not shown in FIG. **1**) include track pads, track balls, head-trackers, data gloves, pens, and other devices suitable for positioning a cursor on a computer monitor **31**. The monitor **31** or other kind of display device is connected to the system bus **18** via a video adapter **32**. A printer **38** is connected to the system bus **18** via a printer interface **39**.

Although other internal components of the personal computer **10** are not shown, those of ordinary skill in the art will appreciate that such components and the interconnection between them are well known. Accordingly, additional details concerning the internal construction of the personal computer **10** need not be disclosed in connection with the present invention.

Those skilled in the art will understand that program modules such as an operating system **36**, application programs **37**, and data are provided to the personal computer **10** via one of the local or remote memory storage devices, which may include the local hard disk drive **20**, floppy disk **23**, CD-ROM **26**, RAM **17**, ROM **16**, and the remote memory storage device **33**. In the preferred personal computer **10**, the local hard disk drive **20** is typically used to store data and programs, including the operating system and programs.

When the personal computer **10** is turned on or reset, the Basic Input/Output System (BIOS) **19**, which is stored in the ROM **16**, instructs the PU **14** to load the operating system **36** from the hard disk drive **20** into the RAM **17**. Once the operating system **36** is loaded into RAM **17**, the PU **14** executes the operating system **36** and causes the visual elements associated with the user interface of the operating system **36** to be displayed on the monitor **31**.

The operating system **36**, in conjunction with the BIOS **19** and associated device drivers, provides the basic interface between the computer's resources, the user, and the application program. For the present invention, the preferred application program is a presentation program module **37***a*. The operating system **36** interprets and carries out instructions issued by the user. For example, when the user wants to load the presentation program module **37***a*, the operating system **36** interprets the instruction (e.g., double clicking on the application program's icon) and causes the PU **14** to load the program code into RAM **17** from either the local hard disk drive **20**, floppy disk **23**, CD-ROM **26**, or the remote memory storage device **33**. Once the presentation program module **37***a* is loaded into the RAM **17**, it is executed by the PU **14**. In case of large programs, the PU **14** loads various portions of program modules into RAM **17** as needed.

The operating system **36** provides a variety of functions or services that allow an application program **37***b* to easily deal with various types of input/output (I/O). This allows the application program **37***b* to issue relatively simple function calls that cause the operating system **36** to perform the steps required to accomplish various tasks, such as displaying text on the monitor **31** or printing text on the attached printer **38**. Generally described, the application program **37***b* communicates with the operating system **36** by calling predefined functions provided by the operating system **36**. The operating system **36** responds by providing the requested information in a message or by executing the requested task.

With continuing reference to FIG. **1** and now turning to FIGS. **2***a*–**7**, the user's environment for the preferred embodiment of the present invention will be described by

utilizing screen displays generated by the preferred application program.

FIGS. **2***a*–**7** illustrate the screen displays provided by the preferred presentation program module **37***a* to allow the user to design a color presentation, to convert the color presentation to an on-screen black and white presentation, and to print either a colored version or a black and white version of the presentation as viewed on the display screen. For purposes of this discussion, the term "presentation" is used to describe a standard slide or page containing objects, images, text, and the like viewed within a presentation display area **52**. The presentations are based on design templates, which contain standard backgrounds, installed with the presentation program module **37***a*.

FIG. **2***a* depicts an initial presentation display screen **50** that is displayed on the monitor **31**. The presentation display screen **50** includes the presentation display area **52**, a series of general operational choice menus **54***a–i*, drawing design buttons **56***a–o* and a standard tool bar **60**. The presentation display screen **50** is displayed by the presentation program module **37***a* after the user selects the presentation program module **37***a*, which is stored in the system memory **15** of the computer **10**.

Because the present invention focuses on one aspect of the presentation program module **37***a*, the black and white presentation feature, primary focus will be placed on the general operational menus, namely the "File" menu **54***a* and the "View" menu **54***c*, and a black and white view button **58** located at the right end of the standard tool bar **60**, which are the main functions used in the preferred embodiment of the present invention.

The slide presentation screen provides a "File" menu **54***a* that may be used to open existing presentations stored in one of the computer's memory storage devices, open new presentations so that the user may design a new presentation by using the drawing design buttons **56***a*-o, save a slide design, or print the slide or slides selected by the user in color and/or black and white. A "View" menu **54***c* allows the user to view the presentation in different formats, including outline form, slide form, and black and white form. Of particular interest is the use of the black and white feature under the "View" menu and the black and white view button **58** located at the right end of the standard tool bar **60** for reasons to be described below.

In FIG. **2***a*, a color presentation (not shown) is selected by one of the methods described above, either designing a new presentation or opening an existing presentation. After the color presentation is designed or selected, the presentation can be converted to a standard black and white version of the presentation **62**. This standard conversion is performed by clicking the black and white preview button **58** using the mouse **29**. An enlarged version of the preview button **58** is shown in FIG. **2***b*. When the black and white preview button **58** is selected, the color presentation is automatically changed to the black and white version of the presentation **62** as depicted on the presentation display area **52** of the presentation display screen **50**. The presentation program module **37***a* of the present invention automatically selects a mode for conversion to black and white for the entire presentation **62**. There are various modes for conversion to black and white that will be discussed in greater detail below. The mode selected by the program module is an Automatic mode, which converts the presentation **62** to default black and white settings based upon graphical items present in the presentation **62**. Graphical items include pictures, graphs, text, backgrounds, closed shapes, figures, frames, lines, and so forth.

Another avenue by which the user can convert the color presentation to black and white is illustrated in FIG. **3**. FIG. **3** depicts a screen display with the "View" menu selected. The user selects the "View" menu **54***c* by clicking onto the word "View" using the mouse **29**. The user then moves down to a black and white option **80** located in the "View" menu **54***c* using the mouse **29**. By selecting the black and white option **80**, the color presentation is converted to its black and white presentation **62**. As previously described, the presentation program module **37***a* of the present invention automatically selects a mode for conversion to black and white. The Automatic mode converts the entire presentation **62** to default black and white settings based upon the type of graphical items present in the presentation **62**. These default settings convert objects and text in the presentation **62** according to the following guidelines listed in Table 1.

TABLE 1

Automatic mode	
graphical item	default B&W setting
Text	Black
Text shadows	Omitted
Fills	Gray scale
Frame	Black
Object shadows	Gray
Lines	Black
Backgrounds	White

After selecting the black and white preview button **58** (FIGS. **2***a* and **3**) or selecting the black and white option **80** under the "View" menu (FIG. **3**) to obtain the default black and white settings listed in Table 1, the user may want to customize the black and white presentation **62** to obtain a better contrast for specific graphical items or view the presentation **62** from various black and white perspectives before printing the presentation **62** on the printer **38**. In order to customize the presentation **62**, the user must select the specific graphical item that the user wants to change. This customization process will be described in greater detail with respect to FIGS. **4** and **5**.

Now turning first to FIG. **4**, a screen display depicts a selection of a graphical item and a contextual menu associated with the graphical item. The user selects the desired graphical item by moving the mouse **29** to the location of the graphical item and clicks the mouse **29**. Once the user clicks the mouse **29** on the graphical item, the graphical item is highlighted (not shown). In this screen display example, the background **82** of the presentation **62** is selected as the graphical item to be converted to another mode of black and white. After selecting the background **82**, the user clicks the mouse **29** a second time to obtain the contextual menu **84**, which appears in the presentation display area **52** near the selected graphical item. The contextual menu **84** contains a list of commands **86***a–k* that may be performed with respect to the selected graphical item. These commands include cut **86***a*, copy **86***b*, paste **86***c*, and particularly, black and white **86***h*.

The user moves the mouse **29** until the pointer highlights the black and white command **86***h* within the contextual menu **84**. Once the black and white command **86***h* is highlighted, a sub-menu **90** appears on the presentation display area **52** of the presentation display screen **50**. This sub-menu **90** contains a plurality of modes **88***a–j* for conversion to black and white. These modes for converting the selected graphical item to black and white include the Automatic mode **88***a*, which was discussed earlier, a Gray

Scale mode **88***b*, a Light Gray Scale mode **88***c*, an Inverse Gray Scale mode **88***d*, a Gray With White Fill mode **88***e*, a Black With Gray Fill mode **88***f*, a Black With White Fill mode **88***g*, a Black mode **88***h*, a White mode **88***i*, and a Don'Show mode **88***j*. These modes each describe a different method for converting colors in the selected graphical item to black, white, and shades of gray. Those skilled in the art will appreciate that the present invention is not limited to this set of modes for converting a color presentation to black and white. The various modes will be discussed in greater detail below along with representative flow diagrams for the Black With White Fill mode, the Gray With White Fill mode, and the Black With Gray Fill mode, FIGS. **9–11**, respectively.

When the sub-menu **90** appears on the presentation display screen **50**, the user selects one of the various modes for conversion to black and white by moving the pointer to the desired mode using the mouse **29**. Once the mode is selected, the selected graphical image immediately changes to the mode of black and white selected. As a result, the user sees an on-screen representation of the presentation **62** in black and white as it is altered, item-by-item.

Now turning to FIG. **5**, a screen display depicts a customized version of the presentation of FIG. **4**. A presentation **114** as depicted on the presentation display area **52** of the presentation display screen **50** is an example of one way the presentation **62** of FIG. **4** can be altered on-screen and printed by converting specific graphical items. In this case, the user alters the black and white version of the background **82** (FIG. **4**) to a background **120**, a picture **94** in the form of a graph with code (FIG. **4**) to a picture **112**, and text **92** forming the phrase "Action Item" (FIG. **4**) to text **110**. One of ordinary skill in the art will understand that these selected graphical items are not the only graphical items available for conversion to black and white.

To convert the presentation **62** of FIG. **4** to the presentation **114** of FIG. **5**, the user can select the background **82**, as previously described. The user then clicks the mouse **29** a second time to obtain the contextual menu **84** and selects the black and white command **86***h* to obtain the sub-menu **90**. Once the sub-menu **90** appears, the user can select the Light Gray Scale mode **88***c*. Once this mode is selected, the background **82** can be converted to the background **120**, as shown in FIG. **5**.

Next, the user selects the text "Action Item" **92** in FIG. **4**. The user then clicks the mouse **29** a second time to obtain the contextual menu **84** and selects the black and white command **86***h* to obtain sub-menu **90**. Once the sub-menu **90** appears, the user selects the Light Gray Scale mode **88***c*. Once this mode is selected, the text **92** in black can be converted to the text **110**, as shown in FIG. **5**.

Finally, the user selects the picture **94** in FIG. **4**. (See FIG. **2***a* for a clear view of the picture **94**.) The user then clicks the mouse **29** a second time to obtain the contextual menu **84** and selects the black and white command **86***h* to obtain sub-menu **90**. Once the sub-menu **90** appears, the user selects the Black With White Fill mode **88***g*. Once this mode is selected, the picture **94** can be converted to the picture **112**, as shown in FIG. **5**. The results of these changes can be clearly seen upon comparison of FIG. **2***a* and FIG. **5**. One of ordinary skill in the art will appreciate that the graphical items selected and the modes selected for converting these graphical items are not the only combinations available for converting the presentation to black and white.

Referring to FIGS. **1**, **6** and **7**, the printing process for printing a presentation in black and white on a printer will now be described. Turning first to FIG. **6**, a screen display depicts a selection of a "File" menu in connection with printing a black and white presentation on a printer in accordance with the preferred embodiment of the present invention. When the user has completed customization of the presentation **142** as depicted on the presentation display area **52** of the presentation display screen **50**, the user may want to print a final black and white version of the presentation **142** on the printer **38**. Customization may be a process of converting graphical items to various modes before deciding on the final version to print.

To initiate the printing process, the user selects the "File" menu **54***a* using the mouse **29**. The user then moves down the "File" menu **54***a* until a print option **140** is highlighted. Once the print option **140** is highlighted, the presentation program module **37***a* can automatically detect the type of printer chosen and the print dialog box **170**, as shown in FIG. **7**, appears on the display screen **50** (FIG. **6**).

Now turning to FIG. **7**, a screen display of a print dialog box is illustrated in accordance with the preferred embodiment of the present invention. The print dialog box **170** contains the functions needed for printing a presentation on a printer **38**. The print functions include selecting the type of printer **174** for printing, selecting the number of copies **176** to be printed, choosing between printing all slides **178***a*, the current slide **178***b*, and the slide number and/or range of slides **178***c* to be printed, and choosing what to print **180**, such as slides, an outline, and so forth.

If the user wants to print a black and white version of the presentation **142** (FIG. **6**), the user simply selects a black and white checkbox **172** in the print dialog box **170**. When this checkbox **172** is selected, the black and white version of the presentation **142** is automatically sent to the printer **38**. Otherwise, if the user does not select the checkbox **172**, the color version of the presentation (not shown) is sent to the printer **38**. The user completes the print process by selecting an "OK" button **182** in the print dialog box **170** once the user has decided whether to print the color or black and white version. The user may also elect not to print the color or black and white presentation by simply selecting a "Cancel" button **184** in the print dialog box **170**, which cancels all print operations.

With continuing reference to FIGS. **1–7**, the flow diagram of FIG. **8** illustrates the steps that the user follows to create a black and white version of a color presentation. The user begins at the START step **300** by turning on the computer **10** and selecting the presentation program module **37***a* for supporting the computer-implemented process for converting color images to black and white.

In step **302**, the user either designs a color presentation or the user selects a pre-existing color presentation for conversion to black and white. After the selection is made, the user then selects a preview option in step **304**. The preview option allows the user to view a black and white version of the entire color slide. This black and white version of the presentation is a default black and white mode, as previously mentioned, selected by the program module in response to the user selection of the preview option.

To refine this black and white version of the color presentation, the user selects a graphical item on the presentation in step **306**. As previously discussed, a graphical item can be text, a frame, a line, a closed shape, or a picture on a slide or page. A graphical item can also be any combination of these graphical items. The user selects the desired graphical item by moving the mouse **29** to the location of the graphical item and clicks the mouse **29**. Once

the user clicks the mouse **29** on the graphical item, the graphical item is highlighted.

Once the graphical item is selected, the user selects a mode for converting the selected graphical item to black and white in step **308**. The selected graphical item is converted to the black and white version of the selected mode in step **310**. In step **312**, a determination is made whether the user desires the selected mode upon inspection of the converted graphical item. If the mode selected is not desired by the user, then the "NO" branch is followed to step **308**; otherwise, the "YES" branch is followed to step **314**. In the scenario where the user is not satisfied with the mode selected, steps **308** and **310** are repeated until a desired mode for conversion to black and white is selected.

After selecting the desired mode for conversion, an inquiry is conducted in step **314** to determine whether there is another graphical item that the user desires to alter. If there is another graphical item to be altered to a black and white version, then the "YES" branch is followed to step **306**; otherwise, the "NO" branch is followed to step **316**. If there are additional graphical items to be converted to black and white, steps **306–312** are repeated until there are no graphical items remaining to be converted. Next, the user performs step **316** by selecting a print option.

In step **318**, a determination is made whether the user wants to print the presentation in black and white. If the user wants to print the presentation in black and white, the "YES" branch is followed to step **320**; otherwise the "NO" branch is followed to step **322**. In step **320**, the user selects a black and white print option. Selection of the black and white print option automatically sends the black and white version of the presentation to the printer. Otherwise, if the user does not select the black and white print option, the color version of the presentation will be sent to the printer. The black and white conversion and printing process terminates at the END step **322**.

Referring to FIGS. **9–11**, the process by which a computer converts a graphical item to a selected mode, with emphasis on the specific characteristics of the selected mode, will now be described.

FIG. **9** is a flow diagram illustrating the steps for converting a graphical item to black and white in response to selection of the Black With White Fill mode. The Black with White Fill mode, which represents a technique that is known in the art, is primarily designed for converting diagrams and charts that may also contain text.

Now turning to FIG. **9**, at the START step **400**, the computer parameters are initialized, the presentation program module **37***a* (FIG. **1**) is selected, and the color presentation is selected for conversion to black and white in response to user-provided input.

A graphical item is selected in step **402**, in response to user-provided input. After the graphical item is selected, in step **404**, a determination is made whether the selected graphical item is text. If the selected graphical item is text, the "YES" branch is followed to step **414**; otherwise the "NO" branch is followed to step **406**. In step **414**, the Black With White Fill mode is selected in response to user-provided input. Next, the selected text is converted to black in step **416**. In step **418**, text shadows are omitted. The black and white conversion process terminates for this selected graphical item at the END step **420**.

If the selected graphical item is not text, in step **406**, a determination is made whether the selected graphical item is a frame. If the selected graphical item is a frame, the "YES" branch is followed to step **422**; otherwise the "NO" branch is followed to step **408**. In step **422**, the Black With White Fill mode is selected in response to user-provided input. The frame is converted to black in step **424**. The black and white conversion process terminates for this selected graphical item at the END step **420**.

If the selected graphical item is not a frame, in step **408**, a determination is made whether the selected graphical item is a line. If the selected graphical item is a line, the "YES" branch is followed to step **426**; otherwise the "NO" branch is followed to step **410**. In step **426**, the Black With White Fill mode is selected in response to user-provided input. The line is converted to black in step **428**. The black and white conversion process terminates for this selected graphical item at the END step **420**.

If the selected graphical item is not a line, in step **410**, a determination is made whether the selected graphical item is a closed shape. If the selected graphical item is a closed shape, the "YES" branch is followed to step **430**; otherwise the "NO" branch is followed to step **412**. In step **430**, the Black With White Fill mode is selected in response to user-provided input. Next, the fill color of the closed shape is converted to white in step **432**. In step **434**, the shadows of the closed shape are converted to black. For a closed shape that has an existing frame, the frame is converted to black in step **436**. For a closed shape without a frame, a thin black frame is added to the closed shape. The black and white conversion process terminates for this selected graphical item at the END step **420**.

If the graphical item is not a closed shape, in step **412**, a determination is made whether the selected graphical item is a picture or a form of clip art. If the selected graphical item is a picture or a form of clip art, the "YES" branch is followed to step **438**; otherwise the "NO" branch is followed to step **402**. In step **438**, the Black With White Fill mode is selected in response to user-provided input. Text and lines are converted to black in step **440**. In step **442**, text shadows are omitted. Next, the fill color of any closed shape is converted to white in step **432**. In step **434**, the shadows of the closed shapes are converted to black. For closed shapes that have pre-existing frames, the frames are converted to black in step **436**. For closed shapes without frames, thin black frames are added to the closed shapes. The black and white conversion process terminates for this selected graphical item at the END step **420**.

FIG. **10** is a flow diagram illustrating the steps for converting a graphical item to black and white in response to selection of the Gray With White Fill mode. This mode is used primarily for diagrams that do not require maximum contrast and the gray scale quantities look better than the black translation in the Black With White Fill mode.

Now turning to FIG. **10**, at the START step **500**, the computer parameters are initialized, the presentation program module **37***a* (FIG. **1**) is selected, and the color presentation is selected for conversion to black and white in response to user-provided input.

A graphical item is selected in step **502**, in response to user-provided input. After the graphical item is selected, in step **504**, a determination is made whether the selected graphical item is text. If the selected graphical item is text, the "YES" branch is followed to step **514**; otherwise the "NO" branch is followed to step **506**. In step **514**, the Gray With White Fill mode is selected in response to user-provided input. Next, the selected text is converted to gray scale quantities in step **516**. In step **518**, text shadows are converted to gray scale quantities. The black and white conversion process terminates for this selected graphical item at the END step **520**.

If the selected graphical item is not text, in step **506**, a determination is made whether the selected graphical item is a frame. If the selected graphical item is a frame, the "YES" branch is followed to step **522**; otherwise the "NO" branch is followed to step **508**. In step **522**, the Gray With White Fill mode is selected in response to user-provided input. The frame is converted to black in step **524**. The black and white conversion process terminates for this selected graphical item at the END step **520**.

If the selected graphical item is not a frame, in step **508**, a determination is made whether the selected graphical item is a line. If the selected graphical item is a line, the "YES" branch is followed to step **526**; otherwise the "NO" branch is followed to step **510**. In step **526**, the Gray With White Fill mode is selected in response to user-provided input. The line is converted to gray scale quantities in step **528**. The black and white conversion process terminates for this selected graphical item at the END step **520**.

If the selected graphical item is not a line, in step **510**, a determination is made whether the selected graphical item is a closed shape. If the selected graphical item is a closed shape, the "YES" branch is followed to step **530**; otherwise the "NO" branch is followed to step **512**. In step **530**, the Gray With White Fill mode is selected in response to user-provided input. Next, the fill color of the closed shape is converted to white in step **532**. In step **534**, the shadows of the closed shape are converted to gray scale quantities. For a closed shape that has a pre-existing frame, the frame is converted to black in step **536**. For a closed shape without a frame, a thin black frame is added to the closed shape. The black and white conversion process terminates for this selected graphical item at the END step **520**.

If the graphical item is not a closed shape, in step **512**, a determination is made whether the selected graphical item is a picture or a form of clip art. If the selected graphical item is a picture or a form of clip art, the "YES" branch is followed to step **538**; otherwise the "NO" branch is followed to step **502**. In step **538**, the Gray With White Fill mode is selected in response to user-provided input. Text and lines are converted to gray scale quantities in step **540**. In step **542**, text shadows are converted to gray scale quantities. Next, the fill color of any closed shape is converted to white in step **532**. In step **534**, the shadows of the closed shapes are converted to gray scale quantities. For closed shapes that have pre-existing frames, the frames are converted to black in step **536**. For closed shapes without frames, thin black frames are added to the closed shapes. The black and white conversion process terminates for this selected graphical item at the END step **520**.

FIG. **11** is a flow diagram illustrating the steps for converting a graphical item to black and white in response to selection of the Black With Gray Fill mode. This mode, which is known in the art, is used for diagrams where the user wants special fills to remain in the black and white version.

Now turning to FIG. **11**, at the START step **600**, the computer parameters are initialized, the presentation program module **37***a* (FIG. **1**) is selected, and the color presentation is selected for conversion to black and white in response to user-provided input.

A graphical item is selected in step **602**, in response to user-provided input. After the graphical item is selected, in step **604**, a determination is made whether the selected graphical item is text. If the selected graphical item is text, the "YES" branch is followed to step **614**; otherwise the "NO" branch is followed to step **606**. In step **614**, the Black With Gray Fill mode is selected in response to user-provided input. Next, the selected text is converted to black in step **616**. In step **618**, text shadows are omitted. The black and white conversion process terminates for this selected graphical item at the END step **620**.

If the selected graphical item is not text, in step **606**, a determination is made whether the selected graphical item is a frame. If the selected graphical item is a frame, the "YES" branch is followed to step **622**; otherwise the "NO" branch is followed to step **608**. In step **622**, the Black With Gray Fill mode is selected in response to user-provided input. The frame is converted to black in step **624**. The black and white conversion process terminates for this selected graphical item at the END step **620**.

If the selected graphical item is not a frame, in step **608**, a determination is made whether the selected graphical item is a line. If the selected graphical item is a line, the "YES" branch is followed to step **626**; otherwise the "NO" branch is followed to step **610**. In step **626**, the Black With Gray Fill mode is selected in response to user-provided input. The line is converted to black in step **628**. The black and white conversion process terminates for this selected graphical item at the END step **620**.

If the selected graphical item is not a line, in step **610**, a determination is made whether the selected graphical item is a closed shape. If the selected graphical item is a closed shape, the "YES" branch is followed to step **630**; otherwise the "NO" branch is followed to step **612**. In step **630**, the Black With Gray Fill mode is selected in response to user-provided input. Next, the fill color of the closed shape is converted to gray scale quantities in step **632**. In step **634**, the shadows of the closed shape are converted to black. For a closed shape that has a pre-existing frame, the frame is converted to black in step **636**; otherwise, no frame is added for a closed shape that does not have a pre-existing frame. The black and white conversion process terminates for this selected graphical item at the END step **620**.

If the graphical item is not a closed shape, in step **612**, a determination is made whether the selected graphical item is a picture or a form of clip art. If the selected graphical item is a picture or a form of clip art, the "YES" branch is followed to step **638**; otherwise the "NO" branch is followed to step **602**. In step **638**, the Black With Gray Fill mode is selected in response to user-provided input. Text and lines are converted to black in step **640**. In step **642**, text shadows are omitted. Next, the fill color of any closed shape is converted to gray scale quantities in step **632**. In step **634**, the shadows of the closed shapes are converted to black. For closed shapes that have existing frames, the frames are converted to black in step **636**; otherwise no frame is added for closed shapes without pre-existing frames. The black and white conversion process terminates for this selected graphical item at the END step **620**.

For the Gray Scale mode, which is well known in the art, each selected graphical item is converted to gray scale quantities, which are varying shades of gray. This mode is appropriate for realistic drawings, such as drawings of real objects, people, and scenes. This mode is also useful for stylistic symbols like logotypes.

For the Light Gray Scale mode, each selected graphical item is converted to one half of gray scale quantities. For example, black converts to fifty percent gray and fifty percent gray converts to twenty-five percent gray. This mode is appropriate for the same situations as the Gray Scale mode when an image in a background should not stand out.

For the Inverse Gray Scale mode, each selected graphical item is converted to the inverse of gray scale quantities. For

example, black converts to white, white converts to black, twenty percent gray converts to eighty percent gray, and so forth. This mode is useful for diagrams where information from colors must be maintained, but the original colors were chosen to be light in order to contrast with a dark background.

For the Black mode, each selected graphical item is converted to black. For the White mode, each selected graphical item is converted to white. These modes are used only in special situations.

For the Don't Show mode, each selected graphical item is omitted. This mode is usually used for non-essential background decoration that makes the background look cluttered when translated to black and white.

In summary, the present invention provides an improved method for black and white printing of colored pages, which are primarily designed for viewing on a computer display screen or as color presentations. Colored images, objects and text on a presentation can be altered, item-by-item, to view the black and white version of each item before printing the presentation. In addition, a variety of modes for black and white conversion is provided to obtain the best black and white version of the item selected. As a result, the black and white presentation can be printed on a printer as viewed on the computer display screen.

Alternative embodiments will become apparent to those skilled in the art to which the present invention pertains without departing from its spirit and scope. Accordingly, the scope of the present invention is defined by the appended claims rather than the foregoing description.

We claim:

1. A method for converting a colored page containing at least one graphical item to a customized black and white page for black and white printing, such that user-preference determines the appearance of each graphical item on the colored page, comprising the steps of:

(a) selecting said colored page for conversion to black and white;

(b) converting said colored page to black and white default settings;

(c) selecting one of said graphical items for customization based on user-provided input;

(d) selecting one of a plurality of black and white modes for converting said selected graphical item to a preset black and white setting other than the black and white default settings, said black and white modes varying in black and white conversion of said selected graphical item;

(e) in response to selecting said one of said plurality of black and white modes, converting said selected graphical item to said preset black and white setting based on said selected black and white mode; and

(f) repeating steps (c) through (e) for additional graphical items on said colored page,

the colored page being converted to the customized black and white page in accordance with the black and white mode selected based on user-preference for each selected graphical item.

2. The method recited in claim **1** further comprising the step of:

(g) printing the customized black and white page.

3. The method recited in claim **1**, wherein said step of selecting one of said graphical items comprises selecting one of the following:

(1) text, said text comprising alphanumeric characters;

(2) a frame;

(3) a line, said lines comprising line segments and splines;

(4) a closed shape; and

(5) a picture.

4. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting one of the following modes:

(1) a gray scale mode;

(2) a light gray scale mode;

(3) an inverse gray scale mode;

(4) a black with white fill mode;

(5) a gray with white fill mode;

(6) a black with gray fill mode;

(7) a black mode;

(8) a white mode;

(9) a don't show mode; and

(10) an automatic mode.

5. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a gray scale mode, wherein said gray scale mode comprises converting said graphical item to gray scale quantities, said gray scale quantities varying in shades of gray.

6. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a light gray scale mode, wherein said light gray scale mode comprises converting said graphical item to half of gray scale quantities, said gray scale quantities varying in shades of gray.

7. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting an inverse gray scale mode, wherein said inverse gray scale mode comprises converting said graphical item to the inverse of gray scale quantities, said gray scale quantities varying in shades of gray.

8. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a black with white fill mode, wherein said black with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines and frames to black, said lines comprising line segments and splines;

converting text to black, said text comprising alphanumeric characters;

omitting text shadows;

converting closed shape shadows to black; and

adding a black frame to said closed shape without frames.

9. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a gray with white fill mode, wherein said gray with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines to gray scale quantities, said gray scale quantities varying in shades of gray, said lines comprising line segments and splines;

converting frames to black;

converting text to said gray scale quantities, said text comprising alphanumeric characters;

converting text shadows to said gray scale quantities;

converting closed shape shadows to said gray scale quantities; and

adding a black frame to closed shapes without said frames.

10. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a black with gray fill mode, wherein said black with gray fill mode comprises:

converting a fill color of a closed shape to gray scale quantities, said gray scale quantities varying in shades of gray;

converting lines and frames to black, said lines comprising line segments and splines;

converting text to black, said text comprising alphanumeric characters;

omitting text shadows; and

converting closed shape shadows to black.

11. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a black mode, wherein said black mode comprises converting all colors of a figure to black, said figure comprising at least one of the graphical items on said page.

12. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a white mode, wherein said white mode comprises converting all colors of a figure to white, said figure comprising at least one of the graphical items on said page.

13. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting a don't show mode, wherein said don't show mode comprises omitting a figure in its entirety, said figure comprising at least one of the graphical items on said page.

14. The method recited in claim **1**, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting an automatic mode, wherein said automatic mode comprises combining more than one of said plurality of modes to create a standard mode conversion for said selected graphical item.

15. A computer-readable medium on which is stored a program module for converting a colored page containing at least one graphical item to a customized black and white page for black and white printing, such that user-preference determines the appearance of each graphical item on the colored page, said program module comprising instructions which, when executed by a computer, perform the steps of:

(a) selecting said colored page for conversion to black and white;

(b) converting said colored page to black and white default settings;

(c) selecting one of said graphical items for customization in response to user-provided input;

(d) selecting one of a plurality of black and white modes for converting said selected graphical item to a preset black and white setting other than the black and white default settings, said black and white modes varying in black and white conversion of said selected graphical item;

(e) in response to selecting said one of said plurality of black and white modes, converting said selected graphical item to said preset black and white setting based on said selected black and white mode;

(f) displaying the customized black and white page in response to performing step (e); and

(g) repeating steps (c) through (f) for additional graphical items on said colored page, where the additional graphical items are selected based on user-preference.

16. The computer-readable medium recited in claim **15**, wherein said step of selecting one of said plurality of black and white modes comprises selecting a gray scale mode, wherein said gray scale mode comprises converting said graphical item to gray scale quantities, said gray scale quantities varying in shades of gray.

17. The computer-readable medium recited in claim **15**, wherein said step of selecting one of said plurality of black and white modes comprises selecting a light gray scale mode, wherein said light gray scale mode comprises converting said graphical item to half of gray scale quantities, said gray scale quantities varying in shades of gray.

18. The computer-readable medium recited in claim **15**, wherein said step of selecting one of said plurality of black and white modes comprises selecting an inverse gray scale mode, wherein said inverse gray scale mode comprises converting said graphical item to the inverse of gray scale quantities, said gray scale quantities varying in shades of gray.

19. The computer-readable medium recited in claim **15**, wherein said step of selecting one of said plurality of black and white modes comprises selecting a black with white fill mode, wherein said black with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines and frames to black, said lines comprising line segments and splines;

converting text to black, said text comprising alphanumeric characters;

omitting text shadows;

converting closed shape shadows to black; and

adding a black frame to closed shapes without said frames.

20. The computer-readable medium recited in claim **15**, wherein said step of selecting one of said plurality of black and white modes comprises selecting a gray with white fill mode, wherein said gray with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines to gray scale quantities, said gray scale quantities varying in shades of gray, said lines comprising line segments and splines;

converting frames to black;

converting text to said gray scale quantities, said text comprising alphanumeric characters;

converting text shadows to said gray scale quantities;

converting closed shape shadows to said gray scale quantities; and

adding a black frame to closed shapes without said frames.

21. The computer-readable medium recited in claim 15, wherein said step of selecting one of said plurality of black and white modes comprises selecting a black with gray fill mode, wherein said black with gray fill mode comprises:

converting a fill color of a closed shape to gray scale quantities, said gray scale quantities varying in shades of gray;

converting lines and frames to black, said lines comprising line segments and splines;

converting text to black, said text comprising alphanumeric characters;

omitting text shadows; and

converting closed shape shadows to black.

22. The computer-readable medium recited in claim 15, wherein said step of selecting one of said plurality of black and white modes comprises selecting a black mode, wherein said black mode comprises converting all colors of a figure to black, said figure comprising at least one of the graphical items on said page.

23. The computer-readable medium recited in claim 15, wherein said step of selecting one of said plurality of black and white modes comprises selecting a white mode, wherein said white mode comprises converting all colors of a figure to white, said figure comprising at least one of the graphical items on said page.

24. The computer-readable medium recited in claim 15, wherein said step of selecting one of said plurality of black and white modes comprises selecting a don't show mode, wherein said don't show mode comprises omitting a figure in its entirety, said figure comprising at least one of the graphical items on said page.

25. The computer-readable medium recited in claim 15, wherein said step of selecting one of said plurality of black and white modes comprises selecting an automatic mode, wherein said automatic mode comprises combining more than one of said plurality of modes to create a standard mode conversion for said selected graphical item.

26. The method recited in claim 15, wherein said step of selecting one of a plurality of black and white modes for converting said selected graphical item to said preset black and white setting other than the default setting comprises selecting one of the following modes:

(1) a gray scale mode;

(2) a light gray scale mode;

(3) an inverse gray scale mode;

(4) a black with white fill mode;

(5) a gray with white fill mode;

(6) a black with gray fill mode;

(7) a black mode;

(8) a white mode;

(9) a don't show mode; and

(10) an automatic mode.

27. A method for converting graphical items associated with a colored page to a plurality of black and white modes based on user-preference to produce a customized black and white page for black and white printing, comprising the steps of:

(a) selecting one of the graphical items associated with the colored page based on user-provided input for conversion to black and white;

(b) selecting one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white, the plurality of black and white modes each varying in black and white conversion of the selected one of the graphical items;

(c) in response to selecting the one of the plurality of black and white modes, converting the selected one of the graphical items to the black and white conversion associated with the selected one of the plurality of black and white modes; and

(d) repeating steps (a) through (c) for additional graphical items on the colored page,

the colored page being converted to the customized black and white page in accordance with the plurality of black and white modes selected based on user-preference for each selected one of the graphical items.

28. The method recited in claim 27 further comprising the step of:

(f) printing the customized black and white page.

29. The method recited in claim 27, wherein the step of selecting one of a plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting one of the following modes:

(1) a gray scale mode;

(2) a light gray scale mode;

(3) an inverse gray scale mode;

(4) a black with white fill mode;

(5) a gray with white fill mode;

(6) a black with gray fill mode;

(7) a black mode;

(8) a white mode;

(9) a don't show mode; and

(10) an automatic mode.

30. The method recited in claim 27, wherein the step of selecting one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a gray scale mode, wherein the gray scale mode comprises converting the selected one of the graphical items to gray scale quantities, the gray scale quantities varying in shades of gray.

31. The method recited in claim 27, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a light gray scale mode, wherein the light gray scale mode comprises converting the selected one of the graphical items to half of gray scale quantities, the gray scale quantities varying in shades of gray.

32. The method recited in claim 27, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting an inverse gray scale mode, wherein the inverse gray scale mode comprises converting the selected one of the graphical items to the inverse of gray scale quantities, the gray scale quantities varying in shades of gray.

33. The method recited in claim 27, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a black with white fill mode, wherein the black with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines and frames to black, the lines comprising line segments and splines;

converting text to black, the text comprising alphanumeric characters;

omitting text shadows;

converting closed shape shadows to black; and

adding a black frame to the closed shape without frames.

34. The method recited in claim **27**, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a gray with white fill mode, wherein the gray with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines to gray scale quantities, the gray scale quantities varying in shades of gray, the lines comprising line segments and splines;

converting frames to black;

converting text to the gray scale quantities, the text comprising alphanumeric characters;

converting text shadows to the gray scale quantities;

converting closed shape shadows to the gray scale quantities; and

adding a black frame to closed shapes without the frames.

35. The method recited in claim **27**, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a black with gray fill mode, wherein the black with gray fill mode comprises:

converting a fill color of a closed shape to gray scale quantities, the gray scale quantities varying in shades of gray;

converting lines and frames to black, the lines comprising line segments and splines;

converting text to black, the text comprising alphanumeric characters;

omitting text shadows; and

converting closed shape shadows to black.

36. The method recited in claim **27**, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a black mode, wherein the black mode comprises converting all colors of a figure to black, the figure comprising at least one of the graphical items on the colored page.

37. The method recited in claim **27**, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a white mode, wherein the white mode comprises converting all colors of a figure to white, the figure comprising at least one of the graphical items on the colored page.

38. The method recited in claim **27**, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting a don't show mode, wherein the don't show mode comprises omitting a figure in its entirety, the figure comprising at least one of the graphical items on the colored page.

39. The method recited in claim **27**, wherein the step of selecting the one of the plurality of black and white modes based on user-provided input for converting the selected one of the graphical items to black and white comprises selecting an automatic mode, wherein the automatic mode comprises combining more than one of the plurality of black and white modes to create a standard mode conversion for the selected one of the graphical items.

40. A method for converting graphical items associated with a colored page to a black with white fill mode based on user-preference to produce a customized black and white page for black and white printing, comprising the steps of:

(a) selecting one of the graphical items associated with the colored page based on user-provided input for conversion to black and white;

(b) selecting the black with white fill mode based on user-provided input for converting the selected one of the graphical items to black and white, wherein the black with white fill mode comprises:

converting a fill color of a closed shape to white,

converting lines and frames to black, said lines comprising line segments and splines,

converting text to black, said text comprising alphanumeric characters,

omitting text shadows,

converting closed shape shadows to black, and

adding a black frame to said closed shape without frames;

(c) converting the selected one of the graphical items to the black with white fill mode; and

(d) repeating steps (a) through (c) for additional graphical items on the colored page,

the colored page being converted to the customized black and white page in accordance with the black with white fill mode selected based on user-preference for each selected one of the graphical items.

41. A method for converting graphical items associated with a colored page to a gray with white fill mode based on user-preference to produce a customized black and white page for black and white printing, comprising the steps of:

(a) selecting one of the graphical items associated with the colored page based on user-provided input for conversion to black and white;

(b) selecting the gray with white fill mode based on user-provided input for converting the selected one of the graphical items to black and white, wherein the gray with white fill mode comprises:

converting a fill color of a closed shape to white,

converting lines to gray scale quantities, said gray scale quantities varying in shades of gray, said lines comprising line segments and splines,

converting frames to black,

converting text to said gray scale quantities, said text comprising alphanumeric characters,

converting text shadows to said gray scale quantities,

converting closed shape shadows to said gray scale quantities, and

adding a black frame to closed shapes without said frames;

(c) converting the selected one of the graphical items to the gray with white fill mode; and

(d) repeating steps (a) through (c) for additional graphical items on the colored page,

the colored page being converted to the customized black and white page in accordance with the gray with white fill mode selected based on user-preference for each selected one of the graphical items.

42. A method for converting graphical items associated with a colored page to a black with gray fill mode based on user-preference to produce a customized black and white page for black and white printing, comprising the steps of:

(a) selecting one of the graphical items associated with the colored page based on user-provided input for conversion to black and white;

(b) selecting the black with gray fill mode based on user-provided input for converting the selected one of the graphical items to black and white, wherein the black with gray fill mode comprises:

converting a fill color of a closed shape to gray scale quantities, said gray scale quantities varying in shades of gray,

converting lines and frames to black, said lines comprising line segments and splines,

converting text to black, said text comprising alphanumeric characters,

omitting text shadows, and

converting closed shape shadows to black;

(c) converting the selected one of the graphical items to the black with gray fill mode; and

(d) repeating steps (a) through (c) for additional graphical items on the colored page,

the colored page being converted to the customized black and white page in accordance with the black with gray fill mode selected based on user-preference for each selected one of the graphical items.

43. A method for converting graphical items associated with a colored page to an automatic mode based on user-preference to produce a customized black and white page for black and white printing, comprising the steps of:

(a) selecting one of the graphical items associated with the colored page based on user-provided input for conversion to black and white;

(b) selecting the automatic mode based on user-provided input for converting the selected one of the graphical items to black and white, the automatic mode comprising combining a plurality of black and white modes to create a standard mode conversion for said selected graphical item, the plurality of black and white modes each varying in black and white conversion of the selected one of the graphical items;

(c) converting the selected one of the graphical items to the automatic mode; and

(d) repeating steps (a) through (c) for additional graphical items on the colored page,

the colored page being converted to the customized black and white page in accordance with the automatic mode selected based on user-preference for each selected one of the graphical items.

44. The method recited in claim **43** further comprising the step of:

(f) printing the customized black and white page.

45. The method recited in claim **43**, wherein the plurality of black and white modes to create the standard mode conversion for said selected graphical item comprises the following modes:

(1) a gray scale mode;

(2) a light gray scale mode;

(3) an inverse gray scale mode;

(4) a black with white fill mode;

(5) a gray with white fill mode;

(6) a black with gray fill mode;

(7) a black mode;

(8) a white mode; and

(9) a don't show mode.

46. The method recited in claim **45**, wherein the gray scale mode comprises converting the selected one of the graphical items to gray scale quantities, the gray scale quantities varying in shades of gray.

47. The method recited in claim **45**, wherein the light gray scale mode comprises converting the selected one of the graphical items to half of gray scale quantities, the gray scale quantities varying in shades of gray.

48. The method recited in claim **45**, wherein the inverse gray scale mode comprises converting the selected one of the graphical items to the inverse of gray scale quantities, the gray scale quantities varying in shades of gray.

49. The method recited in claim **45**, wherein the black with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines and frames to black, the lines comprising line segments and splines;

converting text to black, the text comprising alphanumeric characters;

omitting text shadows;

converting closed shape shadows to black; and

adding a black frame to the closed shape without frames.

50. The method recited in claim **45**, wherein the gray with white fill mode comprises:

converting a fill color of a closed shape to white;

converting lines to gray scale quantities, the gray scale quantities varying in shades of gray, the lines comprising line segments and splines;

converting frames to black;

converting text to the gray scale quantities, the text comprising alphanumeric characters;

converting text shadows to the gray scale quantities;

converting closed shape shadows to the gray scale quantities; and

adding a black frame to closed shapes without the frames.

51. The method recited in claim **45**, wherein the black with gray fill mode comprises:

converting a fill color of a closed shape to gray scale quantities, the gray scale quantities varying in shades of gray;

converting lines and frames to black, the lines comprising line segments and splines;

converting text to black, the text comprising alphanumeric characters;

omitting text shadows; and

converting closed shape shadows to black.

52. The method recited in claim **45**, wherein the black mode comprises converting all colors of a figure to black, the figure comprising at least one of the graphical items on the colored page.

53. The method recited in claim **45**, wherein the white mode comprises converting all colors of a figure to white, the figure comprising at least one of the graphical items on the colored page.

54. The method recited in claim **45**, wherein the don't show mode comprises omitting a figure in its entirety, the figure comprising at least one of the graphical items on the colored page.

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